has taken place in the character of the street traffic. As a result the public street is far more dangerous to the pedestrian, the child at play, and the occupant of a vehicle than it was two or three decades ago. In fact, the record of railway grade crossing accidents now pales to insignificance compared with those from street accidents not involving railway trains.

The annual report of the police department of the city of Chicago, just issued, throws much light on this condition, although the record on accidents caused by trains at street crossings is not entirely clear. Of persons occupying street cars, motor vehicles, horse-drawn vehicles or bicycles that were struck by trains, 7 were killed and 61 injured in 1919, and 10 killed and 84 injured in 1918. The report also shows that the total number of victims struck or run over by trains at street crossings and elsewhere within the city limits was 83 killed and 57 injured in 1919, and 112 killed and 94 injured in 1918. By comparison with earlier figures, differentiating between the casualties at street crossings and elsewhere, it may be assumed that about 30 to 40 per cent of the above figures represent the approximate totals for accidents at the crossings of streets and tracks. However, there is no occasion for quibbling in this regard when making comparisons with the deaths and injuries resulting from other forms of street accidents as shown below.

In 1919 the number of persons struck or run over by street vehicles (including street cars) was 321 killed and 4,745 injured. This, however, is only part of the story, as another large group suffered death and injury while occupying vehicles that were struck by other street conveyances, i. e., collisions of automobiles or of autos and street cars, etc. Such accidents caused 88 deaths and 2,249 injuries. In other words, we find that in 1919, 419 people were killed and approximately 7,000 were injured while walking or riding on the public streets of Chicago through causes for which the railways were in no way responsible. These figures represent totals in deaths 10 times as great and in injuries 25 times as large as the corresponding casualties resulting from accidents involving trains.

The problem of street accidents due to the number of vehicles and the number of street intersections, running into hundreds of thousands, is obviously much more difficult of solution than that arising from the crossing of streets by railway tracks, and while the public authorities and civic bodies are in a sense alive to this new menace, their efforts at solution have been restricted essentially to safety campaigns, traffic rules, the education of school children, etc.

Except in cases of unusual congestion or the separation of commercial and pleasure traffic, the grade separation idea has received little recognition as a solution of the street accident problem. Since the rule is proved by the exception it is interesting to note that the Illinois Central terminal improvement project at Chicago contemplates subways for pedestrian traffic under two important boulevards, but here the basic reason is that of congestion of traffic rather than one of the safety of the pedestrian.

This raises the question as to the further gains to be made in accident prevention through concentration of expenditures on the separation of railway grades from those of the streets. It is true that congestion of traffic on both streets and tracks makes this imperative in many places, but when we turn to the far more important matter of personal safety, what justice is there in singling out the railway accidents (which now comprise a small portion of the total) for drastic elimination, and apply only palliative measures to the great bulk of the casualties?

The only correct principle to apply in expenditures to reduce accidents is to send each dollar where it will result in the greatest saving of life, and under present circumstances it is not certain that track elevation projects always offer the most fertile field.

Reduction in Railway Expense

UNDER GOVERNMENT OPERATION the operating expenses of the railways were increased about 65 per cent. The operating expenses in December, 1917, were $252,000,000, or at the rate of about $3,000,000,000 a year, while in January, 1920, they were $415,000,000, or at the rate of approximately $5,000,000,000 a year. A large part of this vast increase in expenses has been attributed to the inefficiency of government management. The railway companies in seeking advances in rates have, however, based their calculations as to the additional revenues needed largely upon the operating expenses incurred during the closing months of government operation.

Naturally, this action by the railway companies has been challenged. The question has been raised as to why, if government management was responsible for a large part of the increases in expenses, it will not be practicable under private management to effect large reductions in expenses. The manner in, and the purpose for, which the question has been raised necessarily imply that it should be practicable to make large reductions in expenses not merely in the long run, but in the near future, for it is to put them on their feet financially in the near future that the railway companies are asking for the advances in rates.

The *Railway Age* repeatedly has contended that government operation was less economical than private operation would have been, and has never wavered in its belief that in the future private operation would be more economical than government operation would be. To take this position, however, is a very difficult thing from contending that the railway companies can in the immediate future make large reductions in operating expenses. It is much easier to make increases in expenses that ought not to be made than to get rid of them after they have been made. To what have been due the increases in operating expenses which have occurred since government operation was adopted? In the hearings before the Railroad Labor Board some of the spokesmen of the labor organizations have sought to give the impression that they have been due more largely in proportion to increases in other expenses than to advances in the wages and reductions in the hours of work of the employees.

The operating expenses of the railways are broadly divisible into three classes, first, wages; and second, cost of fuel and of materials and supplies. The wages paid in December, 1917, were $153,000,000, while those paid in January, 1920, were $258,000,000, an increase of 68 per cent. The differences between these amounts and the total operating expenses incurred in the same months give approximately the amounts spent in those months for fuel and materials and supplies. The cost of fuel and materials and supplies in December, 1917, was therefore approximately $99,000,000, and their cost in January, 1920, approximately $157,000,000, which shows an increase in them of just about 60 per cent. It will be seen, therefore, that the increase in the pay roll has been both absolutely and relatively greater than the increase in other expenses.

The increase in the pay roll was due partly to the establishment of the eight-hour day, which resulted in an increase of 250,000 in the number of employees, but principally to advances in wages. The manner in which the Railroad Administration made advances in wages is open to severe criticism, especially its course in standardizing wages throughout the United States regardless of local conditions, and in disturbing many of the relationships which had previously existed between different classes of employees. The result of these things was much larger increases to many employees than were justified. Another result, however, was that some employees did not receive relatively as large advances in wages as they were entitled to,

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and as they must now be given if the railways are to compete with other employers for labor. Regardless, however, of the unwisdom of many of the advances given under government control, no one believes that any reductions will be made at least for some time to come. On the other hand, some advances undoubtedly will be made by the award of the Railroad Labor Board. With respect to the wage matter the railway companies are doing all they can to get it put on the right basis. They are being represented before the Railroad Labor Board by an able committee of managers, who, while not opposing all advances, are presenting all the data and arguments they can to secure an award which will be fair to both the employees and the public.

The result of the increases in the number of employees is that substantially less freight traffic is now being handled per employee than before government operation was adopted. Cannot the railway companies remedy this condition? They undoubtedly can, but it will take time, and what is equally pertinent, it will require large expenditures of capital. Before government operation was adopted the amount of traffic handled by the railways in proportion to the number of men they employed was steadily increasing. This was principally due to the fact that they were investing new capital in the railway plants all the time for the express purpose of increasing the amount of traffic handled in proportion to the number of men employed. Between 1907 and 1917 the increase in the investment in the railways per man employed was $3,000. Meantime, the number of passengers carried one mile per employee annually increased 37 per cent, and the number of tons carried one mile per employee increased 61 per cent. Reductions in grades, elimination of curvature from track, enlargement of terminals, provision of larger cars and more powerful locomotives enabled the railways largely to increase the amount of traffic handled per car, per locomotive and per train, and it was these things which enabled them to handle a constantly increasing business in proportion to the number of men employed. If they had not been able to raise the capital to make these improvements in the physical properties they never would have been able to have effected the economies that resulted. Likewise, in future their success in increasing the amount of traffic handled more in proportion than the number of men employed will be dependent principally upon their ability to raise new capital for productive improvements.

The railways cannot control the prices they must pay for fuel and materials and supplies. Doubtless in course of time the prices of these things will decline if prices in general decline, but their prices will be subject to the same influences as the prices of other things. Increased efficiency in the use of fuel and materials and supplies will be chiefly dependent, like increased efficiency in the use of labor, upon improvements in the physical properties. Reductions, for example, which have been made in the number of tons of coal required to handle a given amount of passenger and freight traffic have been chiefly due to increases in the tractive power and improvements in the design and equipment of locomotives. But the acquisition of larger and better locomotives involves an increase in the capital invested in the railways.

We do not mean to imply that the efficiency with which the railway plant as it now stands is operated, cannot be increased. Undoubtedly it can be, and will be, and every increase in efficiency results in savings. We emphasize now the point that increased economy of operation will depend in the future, as it has in the past, chiefly upon the ability of the railway companies to make improvements in the physical plants, because this is a point which it is so important should be understood at the present time, but which is often overlooked.

In discussions of the need of the railways for raising large amounts of new capital practically all the stress usually is put on the fact that they need to raise capital to increase their facilities. But there is need for the investment of a vast amount of new capital, primarily to make improvements which will result in reductions of operating expenses. In the long run, the railways will be able to make their expenses and their rates much lower, if their rates are made high enough now to enable them to raise adequate capital, than they will be if their rates are in the immediate future kept as low as they legally can be. The great economies in operation in the future will depend, as in the past they have depended, upon the ability of the railways to make improvements which are essential for the greatest economy in the use of labor, fuel and materials.

Railroad Organizations and New Conditions

ONE OF THE PRINCIPAL requisites to continuance of the life, growth and progress of any organism—biological, industrial or social—is that it adapt itself to changes in its environment. A railroad organization is an organism which is strictly subject to this requisite of continued life, growth and progress. Important changes recently have taken place, and are still taking place, in the environment in which railroad organizations must function. Not many railway organizations have been or are being so changed as to adapt them to some very important new conditions; it is largely to this that some of the serious troubles of the roads are due.

Years ago the organizations of the large railroads were divided into operating, traffic, legal, accounting and financial, and purchasing departments. Each of these was created to perform certain functions which, under the conditions existing at that time, had to be performed. Within the last fifteen years the conditions under which the railways must be managed have been enormously changed by two great influences. One of these has been regulation, and the other the labor movement. The conditions have been further changed by the fact that the growth of traffic has so outstripped the expansion of facilities and that today most railways, instead of needing more traffic, as formerly, are in dire need of more facilities with which to handle traffic.

In spite of the revolutionary changes which have occurred, the organizations of most railways are in most important respects what they were fifteen years ago. They have practically the same departments, and the departments are trying to function much as they did then. For example, the traffic department was created, first, to get business, and, second, to fix rates according to what the traffic would bear in order that the railway might make the largest practicable profits. In other words, it was created as the department of sales. It is just as important today to "sell" railroad service at a reasonable price as it was twenty years ago, but this selling must be done in a different way, and requires different qualifications. What is necessary at present is not to convince the shipper that he should route his freight over the traffic man's line, but to convince him that the railway is handling his business as well as it can, and to explain to him why it cannot handle it any better. Also, it is really no longer a function of the traffic department to fix rates. That function now belongs to the Interstate Commerce Commission and the state railroad commissions, and the work of the railroad organization is to get these public authorities to fix adequate rates. This is not merely a matter of preparing data and arguments to present to commissions. What the regulating authorities will do in the long run is determined by public opinion. Therefore, the "selling" of railroad service today is even more a matter of educating public opinion than of convincing public authorities.

There are, however, few railroad companies that have

recognized the fact that either the traffic department should be broadened or an entirely new department—a department of public relations—should be organized for the purpose of constantly presenting the case of the individual roads and the roads as a whole to the general public. The result is that the work of handling public relations—which is mainly that of "selling" railroad service—is divided between the president and all the other departments; that on most roads no particular department concentrates or specializes upon it; and that the work of handling public relations usually is not well done and on many roads is hardly done at all. It is time the railway managements awakened to the fact that the handling of public relations is now one of the most important functions of railroad organization; that it is work which requires as much brains, training and special experience as any other branch of work; and that unless adequate provision for having it properly carried on is made the relations of the railways with the public will not be made satisfactory.

The labor problem also has become entirely different from what it was fifteen years ago. Formerly, most railway employees were unorganized and were dealt with as individuals by the local officers. Furthermore, often the classes of employees that were organized dealt chiefly with the local officers of the individual lines. Most railway employees were then friendly to private operation and did not dream of desiring to substitute management by the employees for management by the companies, as proposed in the Plumb plan. At present all classes of railway employees are organized. National labor movements have taken the place of local negotiations. Many employees are unfriendly to private management, and have been educated to the radical view that management by the employees should be substituted for management by officers representing the owners. Successful handling of labor matters under these changed conditions requires new methods and new types of officers. The conditions suggest the desirability of the employment of high-grade specialists to study the labor problem in all its broader phases and all its details, and to perform the dual function of pointing out to the employees the changes which should be made in their attitude toward their employment and to the companies, and to the companies the changes which should be made in their attitude toward and treatment of the employees. And yet, while, in order to deal with the new conditions in the labor field, many industrial concerns are employing labor managers, we know of no railway which has taken any such step.

In the past the successful railway managers were those who constantly adapted their organizations and their methods to changing conditions. The same thing will be true in future; and in future the most successful railway managers will be those who are as successful in dealing with public relations, and with labor, as they are in devising or adopting improvements in the physical plants and in physical operating methods. But any railway manager who is successful in dealing with the public and with labor will be so because he sees the necessity of adapting his methods and his organization to new conditions.

There is too strong a tendency on most railroads to ignore the extent to which conditions have changed and to refrain from, or to delay making, the changes in their organizations needed. The rapid development and increase in efficiency of our railways in the past were mainly due to the fact that their organizations were constantly adapted to changing conditions. The men who made the organizations what they are now would be the first, if in charge now and as full of initiative as when in their primes, to say there is nothing sacrosanct about the organizations they created and that important changes in them are as necessary now, and will be in the future, as they were in the past.

Letters to the Editor

Reducing Delays in Maintenance Operations

SALT LAKE, Utah.

TO THE EDITOR:

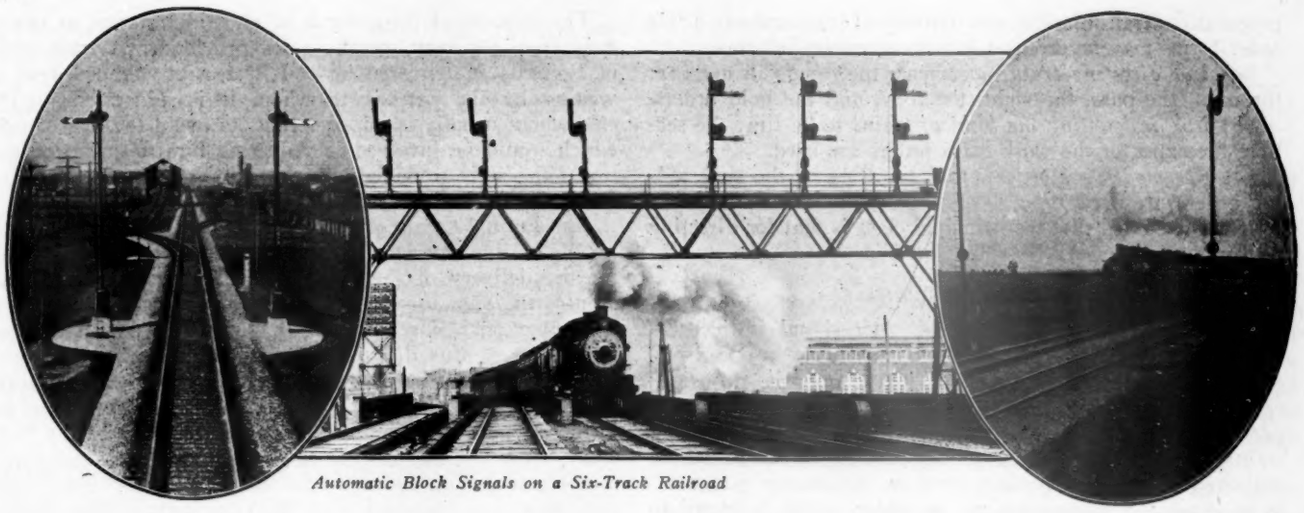
Referring to your editorial in the issue of May 7, entitled "Shall Trains or Workmen be Delayed," one phase of this question not treated in this editorial deserves further consideration. This is proper planning and co-operation on the part of officers and engineers or minor officers under them to bring about the least possible delay both to the operation of trains and the prosecution of work. A strong divisional organization which can properly handle all operations of maintenance, renewals and construction that may to a certain extent interfere with traffic if not properly handled, is preferable to a departmental organization in handling such work. The division superintendent responsible for both operations will find means to carry on the work with the least delay to all.

Recently, in the construction of a section of second track, where the division forces were handling the track laying and work train service in general, the problem of distributing material and handling forces to and from work where train movements had reached 50 to 60, and occasionally 75 per day, became serious. The outcome was that the second track was laid by the use of tracklaying machines and the construction operations carried on entirely independent of the main track then in operation for the distribution of material, resulting in considerable economy. In another case where it was necessary to train haul considerable material for widening banks in preparing a diverging branch line for use as a second main track, it was necessary to move a depot back, lay a track through a station ground and extend it a mile and one-half to reach the desired steam shovel pit. All this was properly considered in the estimate for the work and compared with the assumed cost of delays to train operation, work trains and labor.

In the case of rail or structural renewals involving the use of operated rails, a careful study of the train charts will in most all cases show intervals of considerable length where the board is clear in so far as scheduled trains are concerned, and the co-operation of operating officers and field engineers handling work will make it possible to so run trains as to give one or two, or more, periods each day during which track may be used by work gangs without interruption, in which material may be placed to be finally finished during the balance of the working day.

W. R. ARMSTRONG,
Assistant Chief Engineer, Oregon Short Line.

ALL MUST CO-OPERATE.—It will not help railroad conditions to have the government take back the roads, borrow more and more to provide equipment, pay higher and higher wages to satiate from time to time the clamant demands of the railroad brotherhoods, and saddle the resulting deficits upon the public through heavier and heavier taxation. This is what government ownership or operation has meant up to date, and this is the primary cause of the present troubles. What is needed is a reasonable co-operation on the part of the public authorities in the effort to restore the efficiency of the lines and to bring about a restoration of the favorable attitude of the public with respect to railroad securities. This will take some time. It is desirable to hold the amount and character of government interference to the lowest possible minimum.—*Journal of Commerce (New York)*.



Automatic Block Signals on a Six-Track Railroad

Train Operation By Signal Indication

A Discussion of the Two Principal Methods of Directing Train Movements—The Time Interval and the Space Interval

By Henry M. Sperry, M. Am. Soc. C. E.

In Two Parts—Part I.

ON THE RAILROADS of the United States two principal methods of directing train operation are in use: *a* the Time Interval Method, and *b* the Space Interval Method.

The first part of this article will describe briefly these two principal methods, and a comparison of the two methods will be made. This comparison will show that due to inherent disadvantages the time interval method is not efficient for directing train movements. On the other hand, the advantages of the space interval method are such that it is *the* method that permits of efficient train operation.

The increasing costs of labor and of fuel emphasize more than ever the need for the greatest possible efficiency in train operation.

The second part of the article will describe train operation by signal indication and point out the marked advantages of this method of directing train movements.

Time Interval Method

Train operation under the time interval method is directed by: (*a*) time tables; (*b*) train orders and train order signals, and (*c*) train despatching. The time table is the primary authority for the movement of regular trains. Train orders are the authority for movements not provided for by time tables, and for regular time-table trains when, because of delays, the time table must be modified or temporarily suspended. The movement of trains according to time tables and rules which specify a minimum number of minutes between trains moving in the same direction, is the distinctive feature of the time interval method. For trains not carrying passengers this interval is usually five minutes; for trains carrying passengers it is ten minutes.

Time Tables

As defined by the American Railroad Association's Standard Code, the time table is "The authority for the movement of regular trains, subject to the rules. It contains classified schedules for trains, with special instructions relating thereto." The authority for the movement of an extra train on single track is a written order from the train despatcher, customarily sent by telegraph or telephone; in common parlance, "train orders." On a double track line extra trains may be run without formal train orders. In this case the only serious complication is the necessity for keeping slow trains out of the way of those which run faster, and this is usually provided for by a general rule that extras thus run without formal order shall clear the main track ten minutes before the time at which a following faster train is due, by the time table, to arrive. If the extra is a fast train it is *not* run without a despatcher's order.

Prior to the use of the telegraph in train operation, the time table was the sole authority for train movements. Had it been possible to run all trains in exact accordance with the time table, operation of trains would have been a comparatively simple matter. It was not possible, even in the early days, when every road had light traffic, to avoid serious delays to trains; and without electrical communication the art of railroad operation would have been dwarfed in its infancy. The use of the telegraph for authorizing movements, not provided for by the time table, first made it possible to transport passengers and freight without intolerable delays.

Train Orders

The train order, therefore, came into use to supplement the time table. It is defined by the Standard Code as follows: "For movements not provided for in the time table train orders will be issued by authority and over the signature of the [superintendent]. They must contain neither information nor instructions not essential to such movements. They must be brief and clear; in the prescribed forms when applicable; and without erasure, alteration or interlineation. Figures in train orders must not be surrounded by brackets, circles or other characters."

The Standard Code embodies explicit rules and contains forms designed to insure uniformity of practice in the

preparation, transmission, and delivery of train orders. Train order forms may be grouped into three general classes:

(*a*) *For directing train movements* the orders in use are: the meet, the pass, the right, the time, and the hold orders.

(*b*) *For designating the kind of trains* to be run: the section, the extra, or the work extra orders are used.

(*c*) *For modifying orders:* the annulling or the superseding orders are used.

It will be noted that the principal class is that for directing train movements (*a*).

Train Order Signals

The usual type of station train order signal is the two-arm semaphore signal, one arm for movements in one direction and the other for movements in the opposite direction; each arm capable of being displayed in either one of two positions; one position indicating "stop" to approaching trains and requiring them to stop for train orders to be delivered to them; the other position indicating "proceed," to be displayed when there are no orders to be delivered to trains moving in the direction to which that arm applies.

Train Despatching

Train despatching may be defined as the art of directing train movements. It is to the credit of the American train despatcher that he has been able so skillfully to meet the constantly increasing requirements of transportation.[1]

Directing Train Movements

The directing of train movements is accomplished through the use of general rules, local rules, time tables, train orders and train order signals. Under the space interval method there is, in addition, the use of block and interlocking signals.

Directing train movements may be considered broadly under two general heads—(*a*) the preparation and transmission, and (*b*) the delivery, of instructions, rules, time tables and train orders. This division under two heads is to show the marked difference between the preparation and delivery of instructions, rules and time tables on the one hand, and the preparation and delivery of train orders on the other. In the first class we have what may be termed permanent elements, whereas train orders are of a temporary nature.

Instructions, rules and time tables are the *plans* for conducting train operation. They must be prepared and delivered in advance of the time of their use. Train orders, on the contrary, are to meet the ever changing needs which cannot be provided for in advance and must be often made on the spur of the moment. If train operation could be conducted by time tables without delay it would not be necessary to use train orders; such mathematical precision being impossible, train orders and train despatching are essential in efficient train operation. As stated, train orders differ from instructions, rules, and time tables as to the time available for their preparation and delivery. There is ample time for handling instructions, rules, and time-tables; but train orders must often be formulated and transmitted with the utmost speed. The despatching is not efficient if the handling of the train orders causes delay. This may be true even if the order reduces a prospective loss of time, as where the delay would have been still further reduced had there been no delay in the handling of the order. The delivery of the instructions, rules, and time tables is a simple matter, for it can be made days in advance of the movements to which they apply. The delivery of train orders, however, is an entirely different matter, for delivery must be made to *trains in operation;* hence, the *method* of delivery should not cause loss of time.

The *delivery* of the order is of vital importance, as is evident from the very specific rules provided. A train order of Form 31 is delivered to, and its receipt acknowledged in writing by the persons to whom it is addressed. (The engineman usually is an exception; to avoid the loss of time which would be involved in requiring him to go to the station office it is provided that his copy may be delivered to him by the conductor).

The Form 19 train order is required to be signed for only by the station operator. He is held personally responsible for the delivery of the "19" order, but the form does not require the signature of the conductor or the engineman or any other acknowledgment by signature to the despatcher.

Because of this difference in delivery, a moving train is required to stop for a "31" order, but need only slacken speed for a "19" order. If the order should authorize the train to continue its journey, then the delivery of the "31" order, requiring the train to stop, causes a useless delay that might have been avoided by the use of the "19" order. The disadvantages connected with the stopping of trains simply to give them instructions under which they may proceed will be more fully considered under the Space Interval Method.

William Nichols in his excellent book on "Train Operation" says: "The use of the '19' form is not restricted by the Standard Code. However, some roads prohibit its use for restricting the superiority of a train. There has been and still is, no doubt, considerable prejudice against the '19' form order. This is generally because of not thoroughly understanding the difference between the '31' and '19' forms so far as safety is concerned. With a proper clearance card made for the purpose, and with a few restrictions placed upon its use, it is as safe [as the '31'] and certainly is far the best order for the prompt movement of trains."

John F. Mackie, formerly secretary-editor, Train Despatchers' Association of America, and a veteran railroad operating officer, in his article on "Train Rules and Train Despatching Past and Present" declares the crux of the whole matter to be the delivery of the order. "There is increased assurance of delivery of the '19' form because of the requirements that the operator shall personally deliver the order to both the engineman and conductor. He is, therefore, out on the platform prepared to make the delivery. * * * He is an active, instead of a passive agent, in the delivery of the order."[2]

The Space Interval Method

Train operation under the space interval method is directed by:

(*a*) Time tables; (*b*) train orders and train order signals; (*c*) train despatching, and (*d*) the block system. Trains are operated under the space interval method by time table, train orders, and train despatching, the same as in the time interval method. In addition, there are block signals. Although trains are moved under time tables, the block signals enforce an interval of space between trains moving in the same direction, wholly regardless of the time interval. This is the distinctive feature of the space interval method, and is the basis of the block system. The time interval is maintained by attendants, with watches or clocks, at stations. Suppose, under this system, the prescribed interval be ten minutes. At the expiration of that length of time after the departure of the last preceding train, the attendant displays to a train a proceed signal; but if the preceding train has been unexpectedly stopped at some obscure point between this and the next station, this proceed signal is deceptive; it does not remove the danger of a collision under such circumstances, and this danger has to be provided against by the flagging rules. But if the space interval system is in effect the station agent, instead of allowing a train to proceed at

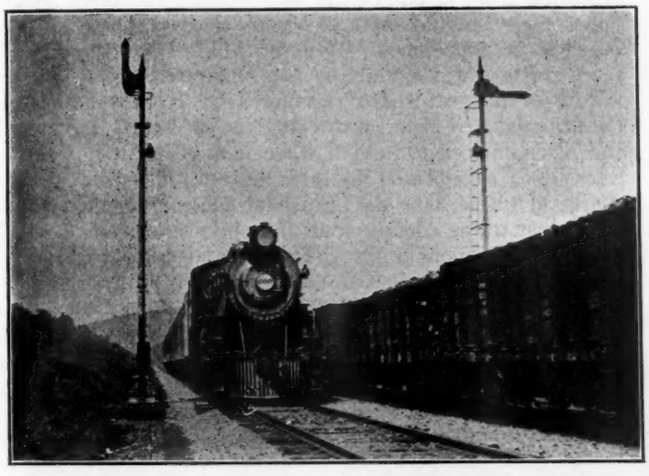
[1]See Appendix at end of article, for the principles of Train Despatching, from book on "Telegraph as Applied to Train Movements," by J. J. Turner, Vice-President of the Pennsylvania system.

[2]Proceedings Central Railway Club, September, 1916.

the end of a period of 10 minutes holds it until he has been informed that the preceding train has actually arrived at the next station, whether the time be 10 minutes or 10 hours. Thus the time interval, in such a situation, is superseded, so far as concerns its function as a preventive of collisions. It becomes merely a convenience.

Time Tables

Under the time interval method, in order to comply with the five and ten-minute rule, trains must not be scheduled at intervals less than five [or ten] minutes. In the space interval method, however, trains may be scheduled at intervals determined by the time required for them to move through the block sections. The passenger service on the express tracks of the Interborough subway, New York City, is a notable example of moving trains under close intervals.



Automatic Block Signals on a Double Track Road of Heavy Traffic

There, under the automatic block system, with sections less than 900 feet long, ten-car passenger trains, moving at 35 to 40 miles an hour, are allowed to follow one another at intervals of one minute and 48 seconds. Without the block system, the time interval system, dependent for safety on the flagman, would be out of the question. Before a flagman could get off his train to start back with his stop signals the time interval would be used up.

Train Orders

In the space interval method there is a decrease in the number of train orders issued, and of those which are issued a larger number are on form 19, as compared with form 31. The decreased use of the written train order is fully considered under Train Operation by Signal Indication. The "19" order keeps trains moving, and obviates one of the most undesirable features of train operation, as heretofore extensively practiced, the stopping of trains for the sole purpose of giving them written train orders.

Eliminating the unnecessary stopping of trains, saves fuel and water and the cost of the wear and tear on cars and engines for these useless stops. Every unnecessary stop creates an unnecessary hazard. By eliminating unnecessary stops, unnecessary hazards are eliminated. Every unnecessary stop is an unnecessary delay, not only to the train that is required to stop, but often to other trains as well.[3]

The St. Louis-San Francisco Railroad has made an estimate of the economy effected by the elimination of useless stops by the use of the "19," instead of the "31" order, and reports an annual saving of $29,630, as follows:

ESTIMATED MONTHLY SAVING; AVERAGE TRAINS PER DAY, 27½.

Reduction of overtime, 5 hours a day, at $4.18 an hour	$647.90
Saving one-half ton coal per freight train per trip, at $3.25 a ton	1,511.25
Saving in wear and tear in not stopping "long-drags" for orders, $10 per day	310.00
Saving per month	$2,479.15

Or an annual saving of $29,630; which is equal to interest at five per cent on an investment of $592,596.

Train Order Signals

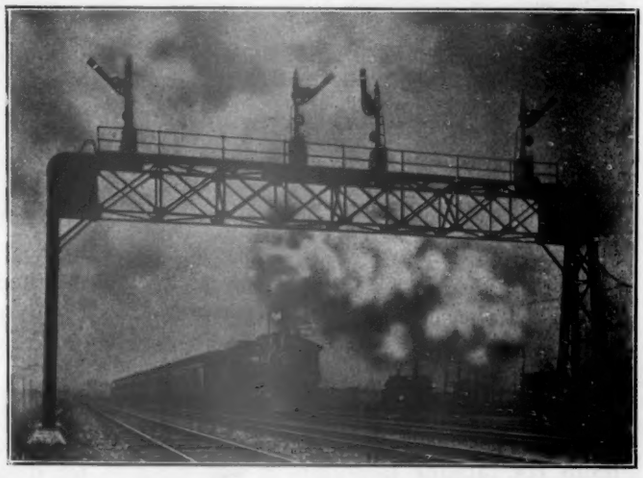
The two-position train order signal, heretofore referred to, *has but a limited use in directing train movements.* It is used only to indicate "stop" for orders; or "proceed" when there are no orders. There is an increasing demand for a signal that can be used in place of, not merely as an adjunct to, written train orders. A signal is needed to direct trains to (*a*) "Take siding"; (*b*) "Hold main," or proceed on main track regardless of superior trains.

On double-track roads equipped with block and interlocking signals, train movements at the interlocking stations are directed by the interlocking signals.

At non-interlocked passing-sidings there is a need for a signal to indicate "take siding," or "hold main." The Erie Railroad (one of the first to meet this need) uses for this purpose a three-position semaphore train order signal giving three indications: "proceed," "take siding," and "stop."[4]

Train Despatching

The principal purpose of train despatching as already suggested in the discussion of the time interval system is to so direct the operations of trains that they may move with maximum safety and minimum delay. Train despatching has



Automatic Block Signals on a Four-Track Railroad

reached a higher level of efficiency under the space interval method than was possible under the time interval method. This has been accomplished by the use of: (*a*) the automatic block system; (*b*) the "19" train order, and (*c*) signal indications in place of written train orders.

The train despatcher directs the movement of trains as if his division were a great interlocking plant. He sends his instructions or orders to the signalmen at the block and interlocking stations; these signalmen in turn direct the movement of trains by signal indications. It is thus possible to move maximum traffic with a minimum delay. The *written* order, with its delays and opportunities for error, is replaced by the fixed signal with its instantaneous operation and unmistakable indications. A despatcher can order a signal cleared, can get it cleared and receive the station operators'

[3] "See Increased Efficiency by Use of Train-Order Form Nineteen," by T. H. Meeks, *Railway Age*, February 1, 1918.

[4] See "Train Operation by Signal Indication on the Erie Railroad," *Railway Age*, July 5, 1918, page 5.

assurance that the object is accomplished in less than one minute; whereas, a train order would require several minutes for transmission and transcription, to say nothing of the delay to the train and the time required by the trainmen for reading it.

The Block System

The Interstate Commerce Commission defined the block system at length in its seventeenth annual report (December, 1903). The following is quoted from this report:

"The term 'block system' shall be taken to mean the methods and rules by means of which the movement of railroad trains (cars or engines) may be regulated in such a manner that an interval of space of absolute length, may be at all times maintained between the rear end of a train and the forward end of train next following."[5]

The Block Signal and Train Control Board defined the block system as:

"Any method of maintaining an interval of space between trains moving on a railroad. Primarily the term refers to the spacing of trains moving on the same track in the same direction, but in practice it is used, on single track lines, both for this purpose and for the protection from each other of trains moving in opposite directions toward each other."[6]

This last definition is a clear statement of the object of the block system, which is to maintain "*an interval of space between trains moving on a railroad.*"

The Standard Code gives definitions, requisites, and rules for the three block systems; the manual, the controlled manual, and the automatic. The manual block system is "a series of consecutive blocks, governed by block signals operated manually, upon information by telegraph, telephone or other means of communication." The controlled manual is "a series of consecutive blocks governed by block signals, controlled by continuous track circuits, operated manually upon information by telegraph, telephone or other means of communication, and so constructed as to require the co-operation of the signalmen at both ends of the block to display a clear or a permissive block signal." The automatic is "a series of consecutive blocks governed by block signals operated by electric, pneumatic, or other agency actuated by a train, or by certain conditions affecting the use of a block."

Time Interval vs. Space Interval; Comparison of the Two Methods

The character of the interval between trains moving in the same direction is the principal difference between these two methods.

In the time interval method, the interval between trains is maintained at stations usually situated at varying distances apart. This time interval, on most railroads, for trains not carrying passengers is five minutes; for trains carrying passengers it is ten minutes. This time interval, as provided by rule, is to allow time for a flagman to protect the rear of a standing train by red flag or red light; and also by torpedoes and fusees. In the space interval method the interval between trains, whatever their class or character, is a *space* interval for all trains. Fixed signals provide for this space interval. The space intervals are called blocks.

The Operating Efficiency of the Two Methods

As has been shown, it is necessary with the time interval method to allow a larger time margin between train movements than is required with the space interval method. On account of this larger time margin, the time interval method is correspondingly less efficient than the space interval.

Both delays and hazards are reduced to the minimum in the space interval method, and its superior efficiency is obvious. Operation at maximum track capacity is not possible under the time interval method. Operation at maximum track capacity under the space interval method *is* possible.

The Relative Safety Factor of the Two Methods

In the time interval method two types of fixed signals are used—train order signals and interlocking signals; these signals not being used to space trains.

The protection of trains depends upon the rules requiring trains to keep a certain number of minutes apart, and upon the flagman's signals for the protection of standing or slow-moving trains.

The Interstate Commerce Commission in a report to Congress, describing the limitations of the time interval method, says: "Without the block system, the right of a train to proceed depends, [a] on the class of the train as regards other trains; [b] on the time, as shown in the time table; and [c] on the vigilance of the engineman in seeing that the preceding train is out of his way. Under the block system these otherwise vital features become matters merely of convenience or expediency. With no block system rear collisions are provided against by flag or lantern signal, but the failure of this safeguard is notorious. It fails both from the negligence of flagmen to carry out or display the signal, and of enginemen to heed it when it is given. On a single-track line, in addition to these uncertainties, the men in charge of trains have the burden of considering their rights as against trains coming from the opposite direction, which are of two or more different classes, and the superiority of which, as related to their train, may vary from hour to hour, or may be varied by telegraphic orders from the train despatcher at any stage of the train's journey. Butting collisions, due to confusion in these things—to mistakes in reading the time table, to wrong telegraphic orders, to non-delivery of orders, to forgetting orders, and other blunders—are as notorious as are rear collisions from flagmen's failures.

"On either double track or single track we have on the one hand (in the block system) fixed signals, situated at known locations, few and simple requirements, and few men to share the responsibility of any given operation. On the other hand, we have in the old system, signals (as flags) not fixed but to be encountered at unexpected places, or no signals at all, compelling dependence on the time tables, watches, and confusing rules of superiority. Responsibility is divided among a larger number of men."[7]

In the space interval (block system) method three classes of signals are used—(1) train order signals, (2) interlocking signals, and (3) block signals. The first two have the same functions as under the time interval system; but the interlocking signals (where they are part of a block system) are used also for spacing trains. The block system, of course, is not absolute perfection, and every road keeps in force the rule requiring flagmen to protect standing or slow-moving trains by hand signals (flags, lanterns, torpedoes and fusees).

"The block system provides that each engineman may, with perfect safety, start and run his train by the sole authority of a visible signal, fixed on a post at the side of the road, which gives him the exclusive right to the track for a given distance (to the next block signal) without limitation as to the time to be spent in getting there, or the speed. The system provides all necessary security against collision, with no question about the importance of the train, or the priority of any other train. So far as safety is concerned, all trains are of the same class."[8]

To maintain between trains a safe and satisfactory interval of *space*—in other words, to prevent collisions—and to do it wholly by means of time—by the use of clocks and watches—would require a station with a clock (and an attendant) every few hundred feet, and it would be imperfect

[5] Seventeenth Annual Report, 1903, p. 345, Sec. 14.

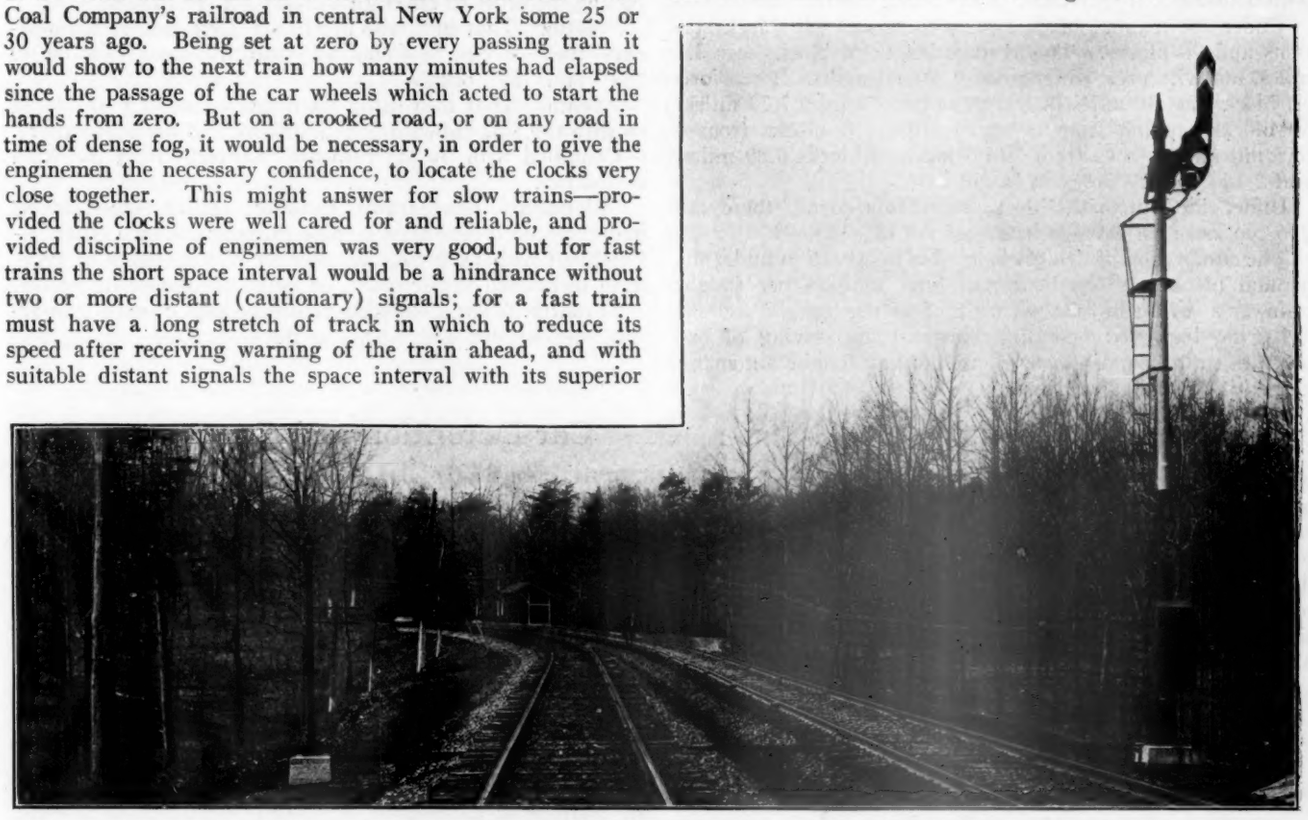
[6] Interstate Commerce Commission: First Annual Report of the Block Signal and Train Control Board (1908), p. 71.

[7] Report of the Interstate Commerce Commission on Block Signal Systems: Senate Document No. 342. 1907; p. 11.

[8] Senate Document No. 342, p. 11.

even then, for the theory of the time interval system requires a length of time sufficient for a flagman to go back and flag. Hence, the inherent weakness of the system. A complete system should have stations, say 1,000 feet apart, and it should have flagmen capable of always going back 1,000 feet, in say, two minutes. A mere glance at a situation like this makes evident the weakness of the system.

Automatic clocks have been tried, but they only serve to show in stronger light the fundamental insufficiency of any time-interval system. A clock on a 20-foot post at the side of the road was in use for a short time on the Fall Brook Coal Company's railroad in central New York some 25 or 30 years ago. Being set at zero by every passing train it would show to the next train how many minutes had elapsed since the passage of the car wheels which acted to start the hands from zero. But on a crooked road, or on any road in time of dense fog, it would be necessary, in order to give the enginemen the necessary confidence, to locate the clocks very close together. This might answer for slow trains—provided the clocks were well cared for and reliable, and provided discipline of enginemen was very good, but for fast trains the short space interval would be a hindrance without two or more distant (cautionary) signals; for a fast train must have a long stretch of track in which to reduce its speed after receiving warning of the train ahead, and with suitable distant signals the space interval with its superior simplicity would be as feasible as the clock interval. And all this ignores one of the important virtues of the automatic block system—its function of detecting broken rails.



Away Down South in Dixie. The "Proceed" Indication of the Signal Extends the Engineman's "Vision" Around the Curve

Relative Safety of the Three Block Systems

The Manual block system: (*a*) A man-operated system. (*b*) The signals are operated *entirely* on information transmitted by telegraph, telephone or electric bell code. (*c*) The correct operation of the system is entirely dependent *upon human agency without mechanical check.*

The Controlled Manual: (*a*) A man-operated system. (*b*) The signals are operated on information transmitted by telegraph, telephone, or bell code. (*c*) The correct operation of the system is dependent *upon human agency, checked by track circuits* throughout the length of the block section.

The Automatic Block System: (*a*) A power-operated system. (*b*) The signals are operated by "electric, pneumatic, or other agency." (*c*) The operation of the instruments in the system is controlled, not by human agency but by the passage of the train into and through the block section, through the medium of the continuous track circuits.

From a safety standpoint, the control of the signals by the train is the vital point of difference between the systems. In the manual block system the *train does not control the operation of the signals,* for no mechanical check is provided, when the block is occupied by a train, to prevent the display of the clear signal behind it. In the controlled manual system the train but partly controls the signals. In the automatic block system the *train completely controls them.*

Relative Operating Efficiency of the Three Systems

Delays of trains reduce the capacity of the tracks, therefore, the operating efficiency of the three block systems may be measured by the relative amount of train delays directly chargeable to block operation.

Train delays chargeable to block operation are unavoidable if the block sections are too long for the movement of trains as frequently as the terminal is ready to send them out.

The ideal method for determining the length of block sections to insure operating efficiency is by taking the required time interval between trains—the frequency required by the volume of traffic which it is desired to move—and making the *time* lengths of the block sections such as will permit of train movements under clear signals. Measured in time the block lengths will be the same, but measured in distance the block lengths will vary with the speed; e. g., the short block on an up grade may be the equivalent of a much longer block on a down grade. Or, further, the block in which a station or other stop is made must be shorter in length than one in which no stop is made.[9]

In the two manual block systems this ideal method is often disregarded because of the tendency, when locating block stations, to give first consideration to the cost of wages of signalmen. This consideration for wage cost is at present a constant disturbing element because of the eight-hour law requirement of three signalmen at each block station. When the wage cost is made the first consideration and block stations are placed at passenger stations to utilize the men at these stations as block operators, the result is often a series of blocks that vary so greatly in length, both as to

[9] See Report of Committee X—Signaling Practice; Journal of the Railway Signal Association, March, 1919, p. 42.

distance and time, that the time of trains is limited by the *longest* block. Long intervals between trains are thus inevitable.

In the automatic block system the ideal method can be followed, as the wage cost for block operators need not be considered. The block section lengths and the location of the signals can be arranged for moving trains at maximum track capacity.

The following is an interesting comparison of a manual block system installed on a double-track division of 139.5 miles that was later changed to an automatic block system with a marked improvement in operating efficiency:

Under the manual block system there were 46 block stations and 90 blocks. The average length of blocks was 3.1 miles, but with great differences in their lengths. The shortest block was .39 miles in length and the longest 7.27 miles; 58 blocks ranging from .39 to 4 miles; 16 blocks from 4 to 5 miles; 12 blocks from 5 to 6 miles; 2 blocks 6.89 miles, and 2 blocks 7.27 miles in length.

Under the automatic block, since introduced, there are 296 blocks of an average length of .94 of a mile.[10]

The elimination of delays chargeable to operation under the manual block was one hour and forty minutes per freight train, or a saving in time per train of 15 per cent.

By the improved operating efficiency the saving of expense in train operation was enough to pay for the automatic block *in less than four years.*

Conclusions

In a final analysis of the three block systems to determine which is the most efficient from an operating standpoint, it is necessary to place them on an *equal basis as to track capacity.* Assuming block sections one mile in length, the manual block is the lowest in first cost. The controlled manual is the highest in first cost (installation); but both systems are so high in cost of operation that it is the exception to find either the manual or the controlled manual with the number of block sections necessary for maximum track capacity.

On the contrary, the first cost of the automatic block (somewhat less than the first cost of the controlled manual) is the lowest of the three systems in cost of operation.

The automatic block shows the greatest operating efficiency per dollar of investment.

Appendix

PRINCIPLES OF TRAIN DESPATCHING

The principles of train despatching were clearly set forth years ago by J. J. Turner in his book on "The Telegraph as Applied to Train Movement," in the following terse paragraphs:

"First. That to prevent conflicting instructions and to insure safety, no more than one man can despatch trains on the same track at the same time."—Complied with by a rule to that effect.

"Second. That the despatcher be kept fully advised of all delays, present or prospective, and the position of every train on the road."—Complied with by reports from stations and terminals.

"Third. That orders must be so clearly expressed as to render a misunderstanding of their meaning impossible."—Complied with by the use of rules and forms of the Standard Code.

"Fourth. That the despatcher must know that they are in the hands of some reliable party for delivery."—Complied with by the acknowledgment of the operator giving his initials and office call.

"Fifth. That it is as near certain as anything human can be, that the party who is to deliver them will stop the train to which they are addressed."—Complied with at each train order office, by the use of a fixed signal which shall indicate "stop" when trains are to stop for train orders.

"Sixth. That when delivered to trainmen, they read just as they did when sent by the despatcher."—Complied with by the receiving operator, who repeats the completed order to the despatcher for verification.

"Seventh. That the instructions given to both trains are identical."—Complied with by the use of the duplicate order system.

"Eighth. That the train whose rights are extended must not be moved against the train whose rights are curtailed, without notice to the latter."—Complied with by sending the order first to the train whose right is restricted before completing the order to the train whose right is extended.

"Ninth. That men who are to act upon orders, acknowledge their receipt."—Complied with by rules relating to "31" and "19" orders.

"Tenth. That men using them know that they are doing so with the full knowledge and authority of the despatcher"—Complied with by the response "Correct" from the train despatcher.

"Eleventh. That trains running against other trains under special orders must be able to recognize each other."—Complied with by giving the number of the engine of every train mentioned in the order, or by train number indicators.

"Twelfth. That a complete record be kept of each transaction."—Complied with by use of the despatcher's order book.

[10] Erie Railroad, Susquehanna Division.

Car Detention and Car Shortage

THE WIDESPREAD and harmful effect of the unnecessary detention of freight cars has recently been shown by an analysis of the official reports of the Pacific Car Demurrage Bureau for the months of February and March, 1920. The figures, which are given below, refer to railroad operation in California only, but if a similar condition exists throughout the country, one of the salient reasons for the present car shortage is apparent.

During the month of February, 1920, there were 131,448 cars reported to the Bureau, an increase of 30,178 cars over the same month last year. During the month of March, 1920, there were reported 143,376 cars, an increase of 32,365 cars over the same month last year. These figures disclose the increase in the volume of business during these months.

The next and most important item in the reports is "cars-held-beyond-free-time." Considering that 48 hours, or 2 days' free time, after the first 7:00 a. m. after the cars are placed for industries by carriers, are allowed for unloading and loading, the following figures are vital.

During the month of February, 1920, 7,303 cars were held beyond the free time, an increase of 46 per cent over the same month the previous year and during March, 8,866 cars were held beyond the free time, an increase of 75 per cent over the same month the previous year.

The demurrage charges assessed by the Bureau for the detention of cars in February, amounted to $38,637 and in March to $58,615, or a total of $97,252 for two months, equal to an annual charge of $583,512. These figures also represent a delay to equipment equal to 80,964 car days for the two months referred to.

Chairman Clark of the Interstate Commerce Commission, in a recent address to the National Industrial Traffic League and the American Railroad Association, stated that the public would have the use of 102,000 additional cars through the saving of one hour per car each day. If a saving of one hour per day for each car would increase the supply by the addition of 102,000 cars what would be the volume of business California shippers alone could move if they could save the 80,964 car days now lost by reason of detention to equipment as disclosed by the Pacific Car Demurrage Bureau's reports? It is evident that the remedy for the present car shortage is in the hands of the shipping public.

Concerted Efforts to Relieve Freight Congestion

Consolidation Into Solid Train-Loads—Details of Local Committee's Work—A New Railroad Committee

WASHINGTON, D. C.

THE CONSOLIDATION of as much freight as possible into solid trains to single destinations and distributing centers, as a means of avoiding car congestion in classification yards and minimizing switching movements, is one of the principal recommendations to the railroads and to shippers sent out recently by the Commission on Car Service and by the Interstate Commerce Commission. In the letter of instructions to the local car service committees issued on May 22 by Chairman W. C. Kendall of the Commission on Car Service (noticed last week, page 1528), this element is elaborated at length.

The advantages of the principle are:

1. No material increase in delay or expense for classification of cars at originating points.

2. Entire elimination of switching or regrouping at division or junction points enroute.

3. Expedited movement automatically secured because cars can be forwarded through each division or junction point as quickly as the crews can be changed.

4. Reduction to the minimum of terminal delays.

5. Greatly increased efficiency in car service by increasing the average miles per car per day with more than a relative decrease in operating expense.

Continuing, Mr. Kendall says:

"This plan may be applied effectively under varying conditions. For instance, the flour mills at Minneapolis have found it of mutual benefit to co-operate with the railroads in loading solid trains for Baltimore today, for Philadelphia tomorrow, for New England points the next day, etc. Such trains, kept intact throughout, have actually arrived at destination in 30 to 50 per cent shorter time than isolated cars turned loose in miscellaneous service.

"Similar results may be secured by concentrating the loading of scattered industries in one central yard. This method was responsible during the war for reducing by one half the time consumed in the movement of lumber for ship and airplane construction from the Pacific to the Atlantic coast. * * *

"In terminal switching service grouping of cars for single industries where volume permits, even when located off line, greatly expedites movement and delivery.

"Conditions will usually justify holding cars one or more days to secure the volume required to make a train for a single destination. Solid lots of not less than 25 cars will be found most effective. Such solid lots will, of course, dovetail easily with any system of symboling trains."

Commissioner Aitchison of the Interstate Commerce Commission on May 27, also issued instruction to the Terminal Joint Committees as follows:

"Efficiency of transportation may be substantially promoted by the consolidation, where practicable, of shipments into solid trains for particular destinations and distributing centers. This plan tends to avoid congestion in the classification yards and to minimize switching. To illustrate: Certain petroleum shippers, acting through one of their organizations, avoided congestion at terminal points and minimized switching by consolidating their shipments into solid trains, so that all cars in a particular train were hauled by one railroad to one destination on one day, to other destinations via different roads on the second day and to other destinations via still another railroad on the third day, and so on.

"Each terminal committee should begin at once a study of this problem * * * and should impress upon all shippers and carriers the importance at this time of bending every effort to bring about this desired result * * *."

The principle of solid train movement was urged on the commission by M. J. Gormley, director of the Division of Transportation of the American Petroleum Institute, who had much to do with the development of this plan as assistant to the northwestern regional director under federal control. In a letter to Commissioner Aitchison, Mr. Gormley said that the railroads are awake to the importance of minimizing switching but suggested that the commission call on shippers for co-operation. "The petroleum industry," said Mr. Gormley, "is attempting in every possible way to relieve the situation by the method pointed out."

Mr. Kendall's letter contained elaborate and detailed suggestions on all points of the local committees' work. These include: Immediate check to be made of all cars in terminal waiting for delivery to connecting lines; arrangement with district embargo distributors for embargo information; reports of cars loaded in violation of embargoes; careful study of the handling of l.c.l., including the holding over of cars where advisable; careful arrangement of merchandise schedules; adoption, as far as may be practicable, of consolidated loading to single destinations on specified days; and adequate switching service to industries.

Where, in the opinion of the Car Service and Terminal Joint Committees sufficient facilities exist in the way of truck or other transport service, consideration should be given to embargoes or restriction by permit system on cross town or trap car service. This matter is one depending entirely on local conditions, but it is important that action be taken restricting the use of cars in this service whenever in the judgment of the two committees it is practicable to do so.

Co-operation with shippers and receivers of freight is dealt with in the circular at length. "Business men generally are willing to do anything within reason to improve transportation conditions, realizing as they never have before that our prosperity is being imperiled by the inability of the railroads to meet the needs of the nation."

Shippers are urged to order according to loading capacity; to restrict car orders to one day's program; do not duplicate orders for cars; order cars according to tonnage; have shipments prepared and ready for immediate loading on receipt of cars; hold shipments until the second or third day in order to make carload; work a little over-time and finish a load where practicable, and thus expedite the movement; co-operate with agent in switching service; furnish the billing agent prompt and full instructions; bill shipments through; confine bill of lading to its proper use, do not make it a commercial instrument; do not try to avoid an embargo by billing shipments to an intermediate point with the expectation of reconsigning into the embargo district; do not bill shipments by a circuitous route in order to avoid the effect of embargoes; load ten per cent above capacity of car; do not utilize full free time.

Consignees are exhorted to purchase to avoid long hauls; insist that shipper load cars to full capacity; pool shipments with others in similar need; unload promptly; have shipper forward freight according to daily capacity to unload; present bill of lading to railroad agent before arrival of cars; complete unloading of cars before usual switching time if at all possible; work a reasonable amount of over-

time if necessary to get cars switched out at the earliest possible time.

Releasing Cars at Galveston

The Interstate Commerce Commission on May 28 issued Service Order No. 4 ordering the Gulf, Colorado & Santa Fe, Galveston, Harrisburg & San Antonio, Missouri, Kansas & Texas of Texas, International & Great Northern and Galveston, Houston & Henderson immediately to exercise the option provided by rule 11 of Texas Lines' tariff I. C. C. 66, and immediately to remove from the cars and store either in their own depot or warehouse or in some convenient and suitable public or licensed warehouse at or near Galveston at the cost of the owner so much of approximately 2,700 cars of grain upon tracks in Galveston subject to the application of said rule 11 as may be accommodated by such depot, or warehouse or by public or licensed warehouses; and that the cars so released shall be at once restored to transportation service.

Reports to the Commission on Car Service continue to indicate a reduction in the accumulations of cars at congested points. On May 21 the total had been reduced to 168,034. On April 24, when the strike conditions were at the worst, the total was 269,000.

At the request of the Interstate Commerce Commission, the Commission on Car Service has directed that coal carrying cars be not used for the loading of automobiles and other commodities that can be transported in box cars, except that coal cars made emptywest of the Rocky mountains may be used for immediate loading to or toward but not beyond the owner's rails.

The General Situation

The Commission on Car Service has issued the following summary of general conditions as of May 27:

Box Cars.—Demands for box cars continue very heavy, with shortages existing principally in central and northwestern territory. The relocation of box cars from eastern and southeastern to western territory, now under way, should provide substantial relief to the territories where shortages are most pronounced. Ventilated box car requirements, which have been heavy in the southeastern section, will be increased with the movement of the watermelon crop, and are also increasing in the southwestern and California sections. Equipment should be handled strictly in accordance with Circular CCS 20, and special action taken to insure against undue delay in movement.

Automobile Cars.—There is a heavy demand for automobile cars which is considerably in excess of supply. Labor disturbances and consequent congestion has contributed in delaying movement, and special attention should be given the prompt movement in accordance with car service rules and special instructions in effect.

Flat Cars.—The loading of flat cars should be restricted to commodities which cannot be accommodated in other types of cars. It is important that movement and repairs be expedited.

Stock Cars.—This equipment should be handled strictly in accordance with car service rules and special instructions. The volume of traffic requiring stock cars is particularly heavy in Texas and at market centers, making it necessary to withdraw this class of equipment from general service in the territory formerly comprising eastern and Allegheny regions and roads in the southwestern section. It is important that delay in forwarding this equipment to live stock territory be minimized to fullest possible extent, due regard, of course, being given to car service rules.

Refrigerator Cars.—Heavy demands in prospect for refrigerators. All available cars being crowded to California to protect cantaloupe movement from Imperial valley now about starting. Loading in southwest is protected practically to full extent. Heavy demands from dairy and meat shippers in territory between Chicago and Missouri river, including reports of short supply from some of the large packers. Preparations being made to handle the peach crop from Georgia which will soon be ready to move.

Open Cars.—A slight increase will be noted in the bituminous coal production during the last half of May as compared with the first 15-day period. Labor conditions in a number of the larger terminals are considerably improved and speedier movement through the important gateways reflects extraordinary efforts being put forth by all concerned to better the situation. The situation at Lake Erie ports is very serious and the car supply for the movement of coal and ore is anything but adequate to protect extraordinarily heavy movement planned for this season. It is expected that the special movement of coal cars from the west to the lines east of the Mississippi river will result in a greatly improved car supply on the roads handling this lake tonnage. There is no improvement in the mill gondola situation and all roads are under special instructions to move these cars as promptly as possible to the steel territory. Miscellaneous commodities are receiving fairly good car service but in some cases it has been found necessary to curtail distribution to stone, sand and gravel owing to the serious country-wide shortage of coal and the necessity for keeping mines operating on a limited basis.

Special Committee of Railroad Executives

The re-establishment of an organization representing the railroads with functions similar to those of the Railroads' War Board in 1917 may result from the appointment, at a meeting of the Association of Railway Executives at Washington on May 28, of a special committee to co-operate with the Interstate Commerce Commission in handling the present emergency situation. The members of the committee are: Daniel Willard, president, Baltimore & Ohio, chairman; A. H. Smith, president, New York Central; C. H. Markham, president, Illinois Central; Hale Holden, president, Chicago, Burlington & Quincy; W. B. Storey, president, Atchison, Topeka & Santa Fe; B. F. Bush, president, Missouri Pacific; E. J. Pearson, president, New York, New Haven & Hartford, and Howard Elliott, chairman, Northern Pacific.

This committee succeeds the committee headed by Hale Holden, president of the Chicago, Burlington & Quincy, that has represented the executives' association in conferences with the Interstate Commerce Commission since the railroads filed their petition asking the commission to exercise its emergency powers in the handling of car service matters. The committee is to consult with the individual roads and attempt to formulate a plan for co-operative action.

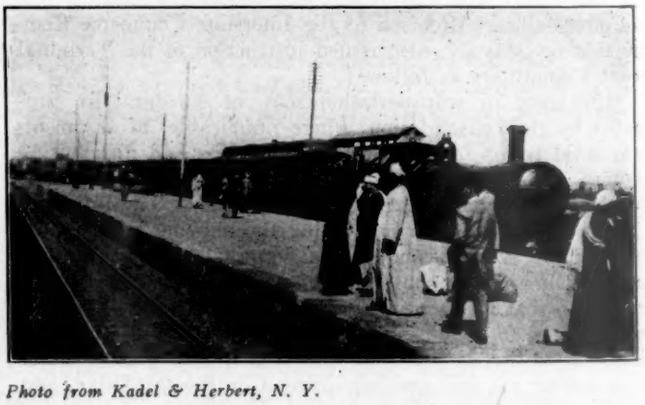


Photo from Kadel & Herbert, N. Y.

Turkish Railroad Train on the Line from Alexandria to Cairo, Egypt

Some Roads Not Complying With Car Service Orders

WASHINGTON, D. C.

REPORTS received by the Interstate Commerce Commission indicate that a number of railroad operating officials have not yet had brought home to them the fact that car service orders of the Interstate Commerce Commission have the force of law and that violations are subject to penalties provided by the law. Commissioner Aitchison, in charge of car service matters for the commission, on June 2 sent the following telegram to Daniel Willard, chairman of the special committee on car service matters of the Association of Railway Executives:

"Commission desires me to state that present emergency which led commission to issue its Service Orders Numbers one, two and three is of such grave character that full and prompt compliance with the orders in detail must be expected. Reports which come to us from our inspectors throughout the country show that in many instances deliveries of equipment have not been made as required by Service Orders two and three. In candor, the commission feels it should state to executives of carriers who are represented by committee of which you are chairman, that prompt, full and literal compliance with these service orders is expected and that violations thereof will be made the subject of inquiry by commission with view to institution of proceedings for the enforcement of the penal provisions of the Interstate Commerce Act governing violations of orders of the commission in such cases. The commission will appreciate it if you will see that your committee understands our position in this matter and that the policy outlined is communicated to all carriers affected. The public interests to be served in this emergency require immediate and complete compliance with these orders so that the transportation needs of the country may be even partially met. It is hoped that compliance with these service orders will be so prompt and free that there may be no occasion for recourse to the penalty sections of the act."

The Service Orders Nos. 2 and 3 referred to are those which gave specific directions to individual railroads to deliver definite numbers of empty cars daily in order to return empty box cars of western road ownership to the owning lines or their direct connections and empty coal cars of eastern ownership to the owning lines or their direct connections, in order that they be made available for needed service for grain and coal loading. The reports received by the commission indicate that many operating officers are still under the impression that the interstate commerce act is a matter of concern only for traffic officials and lawyers and that they have failed to appreciate the effect of the jurisdiction over transportation matters which has been given to the commission by the new transportation act.

Paragraph 17 of Section 402 of the transportation act makes it the duty of all carriers by railroad subject to the act and of their officers, agents and employees, to obey strictly and conform promptly to orders and directions of the commission as to car service and provides for a penalty of not less than $100 nor more than $500 for failure or refusal to comply with such an order or direction and $50 for each and every day of the continuance of such offense, the penalties to be recovered in a civil action brought by the United States.

WESTERN MARYLAND RAILWAY EMPLOYEES are making plans to erect soldier monuments near the company's stations in the cities of Cumberland, Elkins (W. Va.), Hagerstown and Baltimore. The monuments will be of granite in the shape of arches and will contain bronze tablets with the names of all employees who served during the war. Each monument will cost approximately four thousand dollars.

Hearing on Loan Fund for Equipment

WASHINGTON, D. C.

A HEARING before Commissioners Meyer, Daniels and Eastman, sitting as Division No. 4 of the Interstate Commerce Commission on the question of the disposition of the $125,000,000 which the commission has tentatively decided to use for equipment out of the $300,000,000 loan fund, brought forth a considerable variety of views.

W. A. Colston, director of the commission's Bureau of Finance, proposed tentatively an equipment corporation, in which the railroads would take stock to the amount of their loans from the government, the stock to be turned over to a voting trust, the trustee to act under the direction of the commission, and the equipment to be rented.

The committee representing the Association of Railway Executives adhered to its original recommendation that the loans be made to the railroads in a proportion based on their standard return, with the alternative that the commission make loans from the fund to the applicants, who would supplement the loans to the largest extent from their own resources and credit.

S. Davies Warfield, president of the National Association of Owners of Railroad Securities, proposed a national equipment corporation not only to purchase the equipment but to manage it.

F. B. Dow, representing fruit and vegetable shippers, urged a centralized control of refrigerator cars.

The railroad representatives objected to the proposals for a single equipment corporation as impracticable, saying the bankers had advised them that equipment trusts of individual roads would find a better market and that a general plan might involve a long delay.

All interests represented spoke of the importance of putting the loan fund at work as quickly as possible, and several individual applicants for portions of the fund described their needs.

Mr. Colston said that many applicants had laid great stress on their own needs for some of the money, but had been less specific as to the public service they could accomplish with it. He seemed to oppose the plan of the executives for apportioning the fund on the basis of the standard return, saying the road with the largest revenues should be the one which can best finance its own needs, but E. N. Brown and Alfred P. Thom pointed out that the way to get the most equipment is to help the company that can supplement the loan and which can finance equipment on a smaller initial payment than some other road. The roads with the best credit, it was said, could finance on the basis of a 20 to 25 per cent initial payment, while others would have to provide 40 per cent cash. Mr. Brown also said that the freight car is a "migratory bird" and will perform public service just the same regardless of who owns it.

Mr. Colston said that $4 of equipment ought to be bought for each $1 of the loan fund, but that it might be necessary for the roads to put up $25,000,000 in cash in addition to the $125,000,000 in order to buy $500,000,000 of equipment. The greatest difficulty lay, however, in the apportionment of the fund. It was brought out that the commission has already practically arranged to make a loan to the Illinois Central to assist it in financing 1,000 refrigerator cars, and Commissioner Daniels said that the road's application had "not been injured" by its showing that its refrigerator cars make 44 miles a day. Mr. Brown and Mr. Thom expressed approval of the idea of the commission handling the fund in a similar way by dealing with individual carriers on the merits of each case. When Commissioner Meyer and Mr. Colston indicated that the commission would much prefer to have a committee of the executives definitely allocate the amount by roads and by numbers and kinds of cars

or locomotives, Mr. Thom explained that this would place the committee in a very embarrassing position, because all roads need some of the fund and it would be hard for a committee of executives to cut any of them off. He pointed out that this fund represents the only 6 per cent money in sight.

E. N. Brown, chairman of the executives' committee on equipment, said the bankers had told him the market is pretty well filled up with equipment trusts and that investors much prefer to discriminate between railroads.

Mr. Warfield said that Mr. Thom's statement as to the difficulty experienced by the executives in trying to apportion the fund between roads represented the strongest argument for a national equipment corporation, because, he said, the railroads have not been able to co-operate among themselves. He said it might be possible to get an authorization for the use of the loan through an equipment corporation by an amendment to Section 210 of the transportation act, which was then in conference, or that it might be accomplished through state laws. He offered to submit a detailed plan.

C. S. Burg spoke on behalf of the application of the Missouri, Kansas & Texas of Texas for a loan of $900,000 to enable it to buy 300 oil tank cars. He was asked to find out whether the receiver cannot furnish part of the cash instead of asking a loan for 100 per cent of the cost.

M. L. Bell said the Chicago, Rock Island & Pacific had filed an application for $5,515,000, the full purchase price of equipment it has already ordered and is now trying to find a way to pay for. If the freight rates are properly increased, he said, the company could finance 75 per cent of the amount by equipment notes.

W. G. Bierd, president of the Chicago & Alton, pointed out that a general plan for buying equipment would not suit his case, as the Alton has applied for $1,000,000 to rebuild coal cars which can be put in service this year. Commissioner Meyer said that no general plan would interfere with such individual applications and that would be passed on as promptly as possible. Mr. Bierd said that the rebuilding of these cars would cost $1,011 each, as compared with $700 for the last lot he had similarly rebuilt and $473 before the war.

The amendment to the loan fund provision in Section 210 of the transportation act, which was passed by the Senate on May 26 and sent to conference, is as follows:

Paragraphs (a), (b) and (c) of Section 210 of the transportation act of 1920, approved February 28, 1920, are hereby amended so as to read as follows:

"Section 210. (a) For the purpose of enabling carriers by railroad subject to the interstate commerce act properly to serve the public during the transition period immediately following the termination of federal control, any such carrier may, at any time after the passage of this act, and before the expiration of two years after the termination of federal control, make application to the commission for a loan from the United States to meet its maturing indebtedness or to provide itself with equipment or other additions and betterments, setting forth the amount of the loan; the term for which it is desired; the purpose of the loan and the use to which it will be applied; the present and prospective ability of the applicant to repay the loan and meet the requirements of its obligations in that regard; the character and value of the security offered; and the extent to which the public convenience and necessity will be served. The application shall be accompanied by statements showing such facts in detail as the commission may require with respect to the physical situation, ownership, capitalization, indebtedness, contract obligations, operation and earning power of the applicant, together with such other facts relating to the propriety and expediency of granting the loan applied for, and the ability of the applicant to make good the obligation as the commission may deem pertinent to the inquiry.

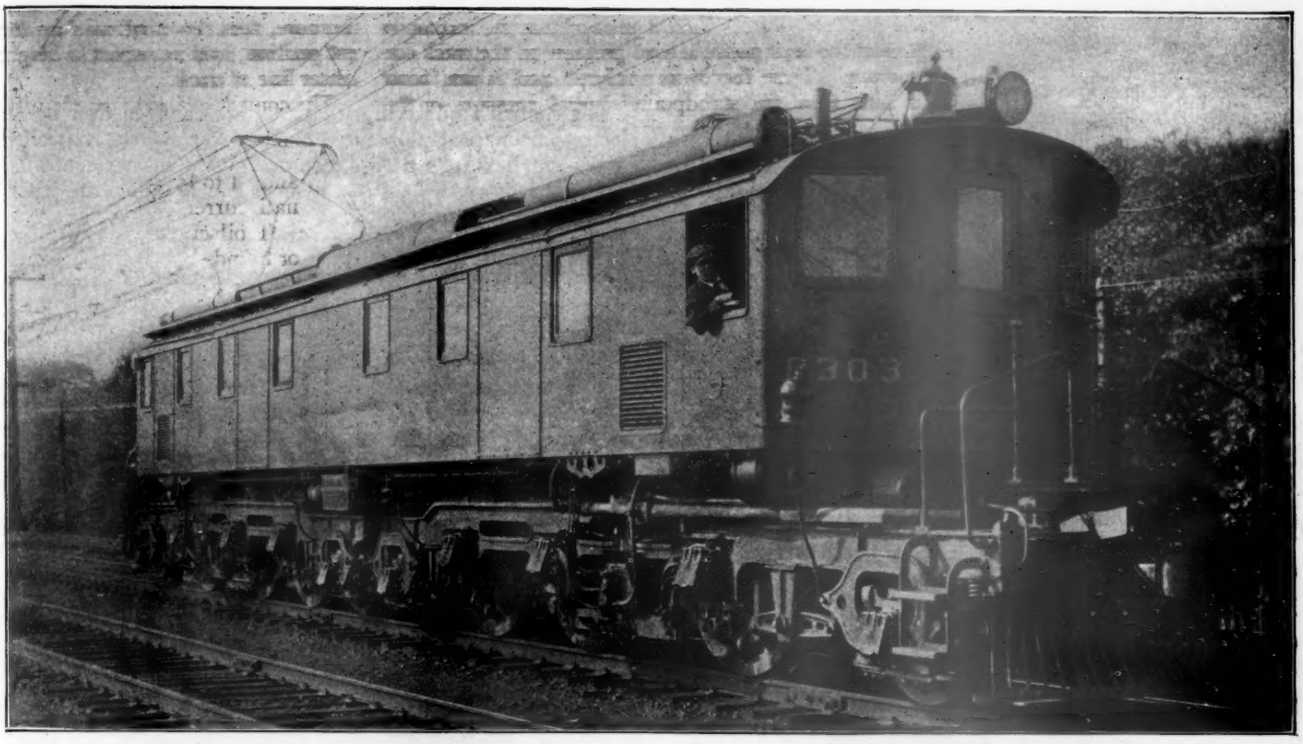
"(b) If the commission, after such hearing and investigation, with or without notice, as it may direct, finds that the making, in whole or in part, of the proposed loan by the United States, for one or more of the aforesaid purposes, is necessary to enable the applicant properly to meet the transportation needs of the public, and that the prospective earning power of the applicant and the character and value of the security offered are such as to furnish reasonable assurance of the applicant's ability to repay the loan within the time fixed therefor, and to meet its other obligations in connection with such loan, the commission shall certify to the Secretary of the Treasury its findings of such facts; also the amount of the loan which is to be made; the time, not exceeding 15 years from the making thereof, within which it is to be repaid; the terms and conditions of the loan, including the security to be given for repayment; that the prospective earning power of the applicant, together with the character and value of the security offered, furnish, in the opinion of the commission, reasonable assurance of the applicant's ability to repay the loan within the time fixed therefor and reasonable protection to the United States; and that the applicant, in the opinion of the commission, is unable to provide itself with the funds necessary for the aforesaid purposes from other sources.

"(c) Upon receipt of such certificate from the commission the Secretary of the Treasury shall immediately, or as soon as practicable, make a loan of the amount recommended in such certificate out of any funds in the revolving fund provided for in this section and accept the security prescribed therefor by the commission. All such loans shall bear interest at the rate of 6 per cent per annum, payable semi-annually, to the Secretary of the Treasury, and to be placed to the credit of said revolving fund. The form of obligation to be entered into shall be prescribed by the Secretary of the Treasury, but the time, not exceeding 15 years from the making thereof, within which such loan is to be repaid, the security which is to be taken therefor, and the terms and conditions of the loan shall be in accordance with the findings and the certificate of the commission."

The Senate on May 28 also passed the amendment proposed by Senator Cummins to Section 207 to provide for funding for 10 years all of the indebtedness of the railroads to the government for additions and betterments made during federal control instead of allowing the Railroad Administration to withhold rental to cover part of the indebtedness. This part of the Cummins amendment had been abandoned by a sub-committee of the Senate committee on interstate commerce and only the amendment to Section 210 was made a rider on the sundry civic bill which was passed. The original amendment, including the proposed changes in both Section 207 and Section 210, came up on the calendar on May 28, and when Senator Underwood said they had both been approved by the full committee the amendment was passed without discussion.

Both the Senate and the House, on June 2, passed the conference report on the Sundry Civil Bill containing an amendment to the Railroad Loan Fund Provision with an additional amendment such as that proposed by Mr. Warfield, providing that loans for equipment may be made to or through such organization, car trust or other agency as may be determined upon or approved or organized for the purpose by the commission for the construction and sale or lease of equipment to carriers.

PENNSYLVANIA RAILROAD STOCKHOLDERS on May 1, 1920, numbered 123,887, an increase of 966 from the number on April 1 and 13,513 compared with that of a year ago.



Latest Type of New Haven Electric Passenger Locomotive

180 Ton New Haven Electric Locomotives

Power Collected from 600-Volt Overrunning or Underrunning Third Rail or from 11,000-Volt Overhead Wire

By F. W. Carter
Heavy Traction Railway Department, Westinghouse Electric & Manufacturing Co.

THE ELECTRIFICATION of the passenger tracks of the New York connection railroad over the Hell Gate route has made possible more extensive utilization of the electric locomotives of the New York, New Haven & Hartford Railroad. Through trains may be operated into the Pennsylvania Station in New York from New Haven without changing engines. This electrification has been carried out by the single-phase, overhead catemary trolley system with the same operating characteristics as those employed on the New Haven road, the energy delivered being at 11,000 volts and 25 cycles. The 900-ton express trains and 420-ton local trains are hauled over this route by five Westinghouse 180-ton locomotives, which are built for service on either direct or alternating current. They are capable of operating through the East river tunnels, which are equipped with third rail, into the Pennsylvania Station, the change from overhead to third-rail operation being effected at the east end of Sunnyside Yard.

Each of these five locomotives comprise two complete truck units, above which a single steel cab is superimposed. The cab extends the entire length of the two coupled units and is mounted on a suitable frame which is spring supported on the main unit frames. Thus the center of gravity is kept at a reasonable height above the rails, and a maximum proportion of the weight is spring supported, as in steam locomotive practice.

By means of a wrought-iron drawbar between the main unit frames, no longitudinal play is allowed between frames. A slight amount of vertical play is provided between drawbar and pockets to take care of track irregularities. The wheel arrangement of each of these main trucks is 2-6-2, and the wheel base of each main unit is 26 ft. 9 in., with a rigid wheelbase of 1 f4t. 3 in. No difficulty is experienced in traversing curves of 24 deg. A pony truck of the Rushton type is placed at each end of a unit. These leading and trailing trucks are provided with heart-links, which insure steady riding, and are side equalized with the main truck equalization system. The leading pony truck is side-equalized with the first two pairs of driving wheels, and the trailing pony truck under the center of the locomotive is equalized with the third pair of driving wheels. This arrangement obtains in both units.

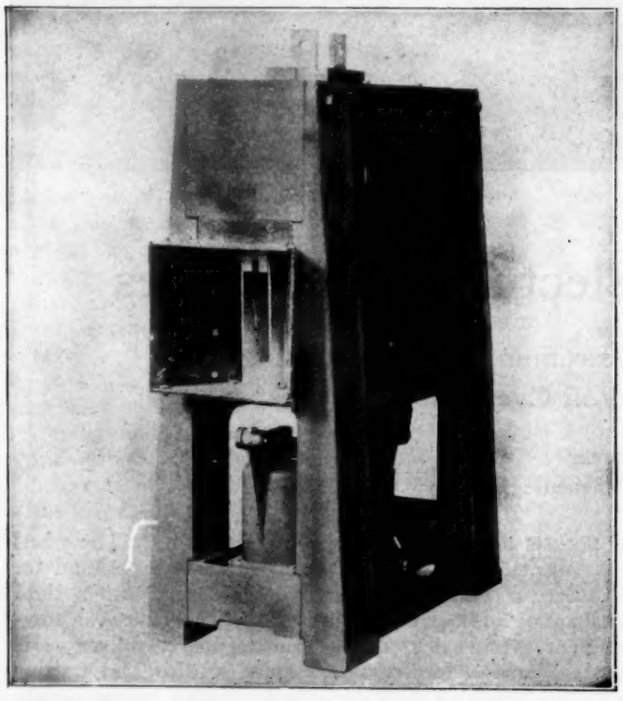
The cab frame consists of a light, rigid structure built of steel plates, and is spring supported at six points on each pair of main unit frames. The cab-carrying springs are of the coil type, four coils to a support, and are open for inspection and renewal. By means of shims, the surfaces of the cab supports are adjustable in height to give a correct distribution of weight on the main frames.

The cab is held in alinement with the main unit frames by two center pins, which are placed 37 ft. 6 in. apart. The distance between these pins must necessarily be constant, while the distance between the unit centers changes somewhat as the two sets of main frames assume an angular position on curves. To provide for this, and to insure that the center pins are allowed a limited amount of longitudinal movement relative to the corresponding unit frame. In this way the

center pins are located in such a position that the locomotive will exert the least possible lateral pressure on the track, due to curving. These forces were analyzed, and it was found that both from the standpoint of lateral pressure on the track and tendency to keep the locomotive progressing in a straight line without nosing, the most desirable location for the center pins was between the Nos. 1 and 2 driving axles of each main truck.

The 12 armatures are arranged in groups of three, connected permanently in series. This arrangement has the advantage of providing a comparatively low voltage across each individual armature, while at the same time the size of the cable in the main motor-circuits and motor-switches need be only sufficient to carry the current of a single motor.

Although these locomotives have a large increase in capacity over the former engines on this road, it was realized that with the continually increasing hauling capacity requirements, the heaviest trains would ultimately have to be double-headed. The control of the new locomotive has been developed so that multiple operation may be obtained with the gearless New



Main, Air Operated, Direct Current Breaker

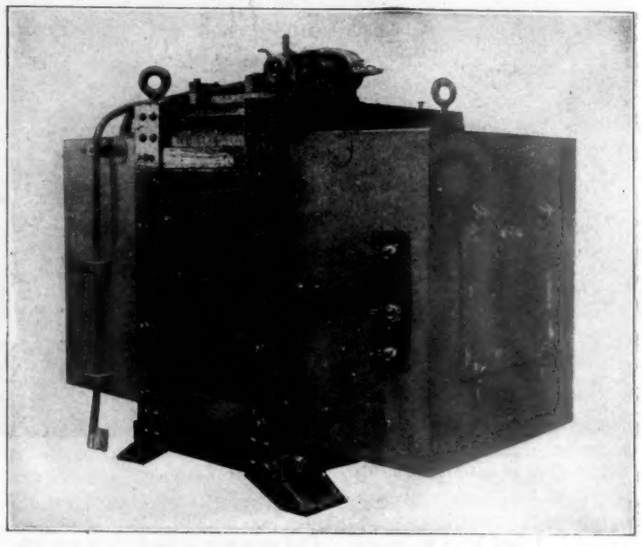
Haven locomotives by changing the master controllers of the latter. In this way, with either locomotive as the leading unit, the load will be divided in proportion to the rated capacity of the two units.

The main transformer is of the two-circuit air-blast type, with a closed metallic circuit on the secondary. The midpoint of the secondary side of the transformer is grounded through a 0.6 kva. transformer, with a lamp across this transformer secondary circuit. In case a ground occurs on the secondary side of the transformer, the effect will be merely to establish a circuit through the ground-detector light, which can be reported and the ground cleared before burning occurs. With the closed metallic circuit, as shown, destructive burning can only happen if two grounds occur at the same time at relatively different voltage points in the circuit.

Another feature is the design of the third-rail shoe and operating mechanism. These locomotives, as previously stated, operate on the tracks of the New York Central, which have an under-running third rail, and the tracks of the Pennsylvania Railroad, which have an over-running third rail. Furthermore, these two third rails are located in a slightly different position, both in respect to height and distance, from the center line of track.

The control and auxiliary circuits are changed over by an electro-pneumatically operated change-over switch, controlled by two small knife switches mounted on the master controller and used to lower the third-rail shoes and to unlock the alternating current pantograph.

The oil circuit breaker can be closed either pneumatically or by hand. It is mechanically latched and electrically tripped.

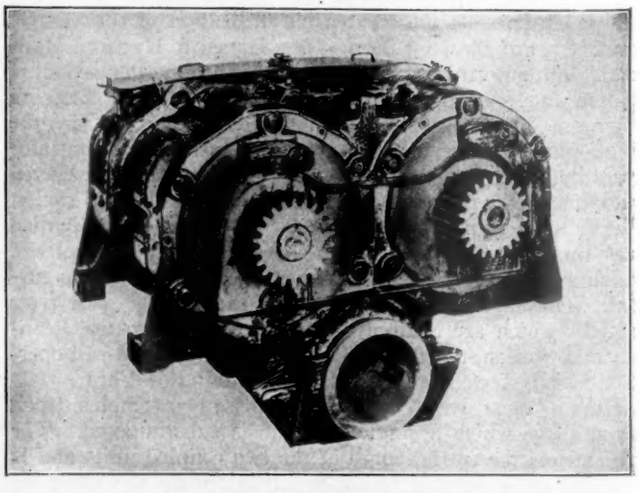


Main Air Blast Transformer

The tripping mechanism is controlled by a time-element relay, so timed as to allow the line section breaker to open ahead of the locomotive breaker in case of short circuit.

The direct-current circuit-breaker is a large, single, electro-pneumatically operated unit switch having a strong magnetic blow-out coil and an automatic trip which operates at a predetermined overload.

Forced ventilation is provided on the locomotives, and the



One of the Pairs of Main Driving Motors

ventilation system has been designed to provide an adequate amount of air for the equipment at all times. The air for the blowers is taken from the inside of the cab, which acts as a large settling chamber for depositing any snow or moisture which may be drawn from the outside. The blowers are used and are arranged with dampers, so that in the event of failure

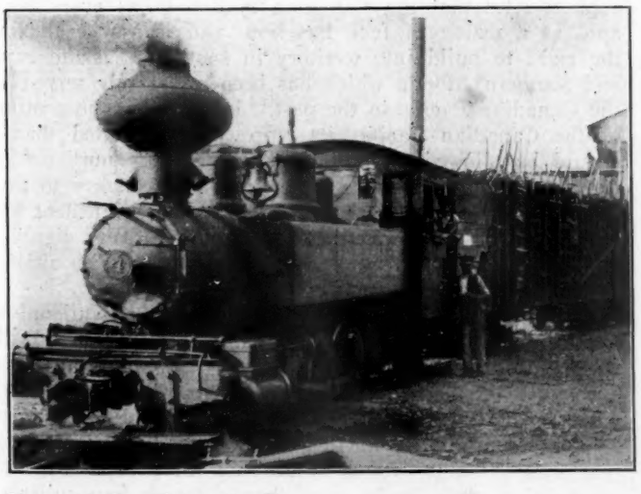
of one blower the other blower can supply air to all the equipment for operation of the locomotive at reduced capacity. The blowers are of the forward curved-blade type, which were chosen on account of their small size and low speed for their capacity and pressure. The blow-motors have been designed so that when operated at a lower voltage they are suitable for driving the air compressors, thus reducing the number of different types of equipment on the engine. Since the safe temperature of the resistance grids is considerably higher than that of the remainder of the equipment, and since it is desirable to cool the main transformer during the periods when the locomotive is operating on direct current, the main transformer is blown at all times, and the air from the outlet of the transformer is used to ventilate the grid resistance. After passing through the apparatus requiring forced ventilation, the air is exhausted outside of the cab at points remote from the air intake.

Air brakes are applied to all of the driving wheels with a separate pair of cylinders for each group. The brake rigging is equalized and the shoes are tandem hung. In addition a hand-brake is provided on each truck unit for holding the locomotive when in a standing position.

The passenger coaches are heated from a kerosene-fired steam boiler installed in the locomotive. Sufficient fuel and water are carried for a one-way trip between New York and New Haven. The water is carried in two main tanks mounted under the cab and suspended from the cab structure. The main reservoir air pressure is maintained in these tanks to force the water into the boiler.

SPECIFICATIONS OF NEW HAVEN ELECTRIC LOCOMOTIVES

Classification: 2-6-2 + 2-6-2.
Number in service: 5.
Class of service: Passenger.
System and voltage: 11,000 volt A. C.—600 volt D. C.
Number driving wheels: 12.
Diameter driving wheels: 63 in.
Number guiding and trailing wheels: 8.
Diameter guiding and trailing wheels: 36 in.
Total weight, including sand, oil and water, is 170 tons.
Average axle weight is 38,500 lb.
Average pony axle weight is 28,750 lb.
Overall length = 69 ft. 0 in.
Total wheel base = 59 ft. 6 in.
Rigid wheel base = 14 ft. 3 in.
Method of drive = geared.
1 Hr. tractive effort = 21,000 lb.
1 Hr. speed = 36 m. p. h.
1 Hr. hp. of locomotive = 2,000.
Max. speed = 70 m. p. h.



Photograph from "International"

A Train Load of Sugar Cane Enroute to a Refinery in Porto Rico

Economic Aspects of the Fuel Oil Situation*

By Eugene McAuliffe
President, Union Colliery Company

WITHIN twelve months the fuel oil situation, insofar as present and future supply, as well as unit costs, are concerned, has undergone startling changes. One year ago we were alone concerned with the economical consumption of fuel oil; today there is a national, even international, feeling that the period of fuel oil consumption for steam making purposes is substantially behind us.

The tide of oil burning for steam making purposes has ebbed and flowed ever since the beginning of the industry, with the discovery and exhaustion of recurring fields, each extraordinary oil development leading to the displacement of coal for steam making purposes on the part of railways, steamship owners and industrial users.

The history of all oil fields is quite alike. They come thundering in to the accompaniment of much that is startling and extravagant, towns spring up over night, fields and hillsides are covered with drilling rigs, temporary tankage, or more frequently earthen storage, is hurriedly provided; not carloads but thousands of carloads of pipe for drilling and oil transport, machinery and building material, are rushed in; extravagance reigns for a period; then comes the steadying down that is invariably followed by the quiet that marks the passing. The more brilliant the beginning the more hurried the end.

Perhaps the greatest stimulus given the consumption of fuel oil for steam making purposes should be credited to the development of the Mexican oil fields, which when due allowance is made for their remoteness, proved the most spectacular oil discoveries the world ever saw. In 1909 and 1910 the greatest oil development in Mexico was well under way and until within the past few months the ever recurring revolution was the principal nightmare suffered by the Mexican oil men. In November of last year Juan Caisno No. 4, after producing 75,000,000 barrels of oil, went to salt water in a few hours. A month later Portrero del Llano of the Mexican Eagle Oil Company, Lord Cowdray's British organization, after producing 110,000,000 barrels of oil at the rate of 16,000,000 barrels annually swung over to salt water in a few hours; then on February 21 of this year Tepetate No. 1 of the Cortez Oil Corporation followed suit; meanwhile numerous less prominent producers have gone the way of all good oil wells.

While the effect of this situation was startling, perhaps the rude awakening suffered by the Naval Department more thoroughly alarmed the oil consumers of the country than did anything else. After practically effecting the consummation of a very extensive oil burning program the Naval Department asking in March last for Pacific Coast bids on 4,500,000 barrels of fuel oil, received but one bid covering a delivery of but 602,000 barrels, at a price of $1.95 per barrel. In April bids were requested for Atlantic Coast deliveries, five tenders returned, covering an entirely insufficient supply, the price for bunker oil ranging from $2.07 to $3.76 per barrel of 42 gallons. A similar fuel problem confronts the American merchant marine, the completed program of the United States Shipping Board, aggregating 10,000,000 dead weight tons, of which 2,000,000 tons will consist of coal burning vessels, 8,000,000 tons of oil burning vessels. The estimated fuel oil requirements of the Shipping Board for the year 1920 are forty million barrels, and for 1921 sixty million barrels. The Director of Operation of the Shipping Board, in referring to the fuel oil requirements of the American Merchant Marine, said that the volume of

*From an address by Mr. McAuliffe before the International Railway Fuel Association.

fuel oil as estimated above "must be produced and transported in special carriers to selected places around the world, failing in which our ships become as useless as painted ships upon a painted ocean."

When we consider that the necessity for maintaining a navy will not cease until the end of the existing generally used form of government, or until the millennium arrives, both of which are perhaps quite remote, it would seem very plain that the requirements of the United States Navy, equipped to carry and burn oil will take precedence over any other demand, and it is equally reasonable to assume that after the American people have spent not only millions but billions in the upbuilding of an American merchant marine, that its fuel oil requirements will take position only second to that of our battleships. The statement of men who should know that 1920 and 1921 will mark the peak period of oil production with a steady decadence from this time forward justifies serious consideration of the oil problem. The United States Geological Survey estimates that with the close of the year 1919 we have taken approximately five billion barrels of oil out of the ground and that the estimated oil reserve yet in the ground is six and one-half billion barrels. What does the future promise?

Between 1909 and 1918 the number of automobiles and trucks increased 1700 per cent, and the consumption of gasoline for automobile purposes jumped from 13,000,000 to 85,000,000 barrels, or 650 per cent, while the production of crude oil increased 95 per cent. Today we operate 7,600,000 automobiles and motor trucks, and 350,000 tractors, and the 1920 construction program totals 2,000,000 automobiles and motor trucks. Power boats, aeroplanes and minor power pumping plants employ thousands of internal combustion engines, all calling for oil and gas. It takes a half pint of oil to translate a ton of coal into power by way of the steam engine, to consume the power so generated takes much more. Without petroleum we could no more grease the bearings and spindles of industry than we could light our great buildings and streets with tallow dips. The total available animal fats together with that which might be possible to extract from sea life in the period of a year would not even dimly light and poorly lubricate the world for one-tenth of that time, even though food fats were taken to swell the supply. The government has thrown open for drilling 6,500,000 acres of national oil reserve, but these lands located in California and Wyoming will not add materially to our supply. In 1919 twenty-nine thousand wells were driven, to success or failure, of these 6,000 were dry, 2,000 returned gas without oil, the drilling expense estimated at $600,000,000.

The translation of oil into steam will quickly cease, through the pressure of economic forces and the transportation companies must perforce sense the changes that are taking place in the fuel oil world. Millions of dollars were saved in past years by the substitution of cheap crude oil and refinery residuum for coal in locomotive fireboxes. Only twelve years ago it was difficult to force the skimming plants of Texas and Oklahoma to take sufficient gasoline out of the crude to make its use on a locomotive safe. The railroads who then absorbed the residue left after the taking off of the lighter distillates built up a comfortable refinery traffic for their rails, but a complete return to coal fuel is now imminent. To avoid the necessity for summary and violent changes the work of shifting fuels should be undertaken at once and conducted quietly and gradually. Fifty million barrels of fuel oil represents twelve million tons of coal. This is not a large tonnage if it were not for the fact that the major portion of the oil is consumed where the coal production is relatively small. Equipment and coaling stations will be required to handle the fuel coal. The subject is one that should command the immediate and serious attention of every railroad executive and operating official in oil burning territory.

Government Versus Private Ownership

THE APPLICATION of the Canadian Pacific to the railway committee of the Canadian House of Commons for a charter to construct a branch line in the province of Saskatchewan has brought to light one phase of the struggle which is now taking place in the Dominion between government and private ownership. At the present time there are in Canada but two great transcontinental systems, practically paralleling each other from the Pacific to the Atlantic coast, one the Canadian National Railways, owned completely by the Dominion government, the other the Canadian Pacific, one of the strongest and best managed privately-owned systems in the world.

As stated before, the Canadian Pacific asked the railway committee of the Dominion House of Commons for the right to build a railway from Saskatoon to Birch Lake in northern Saskatchewan. No request was made for a subsidy or for financial assistance of any kind. The proposed Canadian Pacific line did not parallel any existing lines of the Canadian National or any proposed lines for which the latter holds charters. As a matter of fact, the proposed line crosses at practically right angles two lines which the Canadian National has already constructed and one line for which it holds a charter. Settlers in the territory which would be served by the new line were asking for transportation facilities and in answer to their pleas the Canadian Pacific plans were made.

When hearings were held before the railway committee it was alleged that the Canadian National had in mind the building of a line, which, for a portion of its route, would cover the location of the proposed Canadian Pacific line. However, when the Minister of Railways made a statement to the House of Commons in February, 1920, covering the proposed railway construction to be undertaken by the Canadian National in 1920, no reference was made to a line which would in any way conflict with the proposed line of the Canadian Pacific. It was further argued that, as the Canadian National had been operating the only lines north of the Saskatchewan river in the province of Saskatchewan, all of the country north of that river should be regarded as Canadian National territory, and that the competing railway (the Canadian Pacific) should not be allowed to build even though it was established that the Canadian National had left large tracts of country unserved and neglected. The Canadian Pacific has not subscribed to this principle and in support cites that the Canadian National has every right and, as a matter of fact, has been and is now exercising the right to build into territory in southern Saskatchewan and southern Alberta which has been exclusively served by the Canadian Pacific in the past. In outlining the position of the Canadian Pacific, its representatives stated that it should be allowed to build into the territory north of its existing line provided that such lines are necessary to provide adequate service and to promote further settlement and development. The Canadian Pacific has already signified its willingness that every precaution should be taken against wasteful parallel construction.

In regard to the intention of the Canadian National to build into the territory in question, the Minister of Railways, upon the request of the railway committee, produced a copy of the estimates for 1920 construction, which provided for a start on the Canadian National line in question. The total sum allotted for this work during the present fiscal year was $100,000 which would not, at present costs of construction work, build more than three or four miles of line.

In the end the Canadian Pacific's application was defeated.

Railroads Complete Rate Advance Testimony

Preliminary Valuation Reports Show Cost of Reproduction in Excess of Property Investment Accounts

WASHINGTON, D. C.

DIRECT TESTIMONY of the railroads on their application to the Interstate Commerce Commission for a general advance in freight rates was completed on May 28, thereby establishing a speed record for proceedings of this kind, for the railroads' presentation was made in five days. The hearing will be resumed at Washington on June 7, when the railroad witnesses will be called for further cross-examination, after which evidence on behalf of shippers and state commissioners will be presented. The expediting of the testimony was made possible by the comparative absence of controversy, the fact that the standard of return to be allowed the railroads is prescribed in general terms by the law and they had already submitted the principal facts in support of their request to the commission in filing their applications and in informal conferences, and because the commission showed a marked inclination to discourage the waste of time. The railroads, therefore, planned their presentation to avoid duplications and with a few exceptions there was an absence of the protracted wrangles between witnesses and opposing counsel on comparatively unimportant matters that have consumed so much time in previous rate cases. The railroads were asked, however, to furnish a considerable amount of additional information as soon as it can be compiled, in response to a series of requests for statistical data proposed by the commission and by the shippers for the purpose of a further analysis of the consolidated statistical exhibits already presented.

The testimony given during the first three days of the hearing was reported in last week's issue.

Preliminary Valuation Figures Exceed Property Investment Account

That the preliminary reports of the commission's Bureau of Valuation as to the cost of reproduction are more than sustaining the aggregate property investment accounts of the carriers was asserted by Thomas W. Hulme, vice-chairman of the President's Conference Committee on Valuation, in his testimony before the commission on May 27.

Mr. Hulme gave a summary of the tentative valuations and preliminary reports for 50 railroads, with a mileage of 51,853, showing a cost of reproduction new, including land, as of the valuation dates in 1914, 1915 and 1916, of $3,203,782,543, as compared with a property investment account as carried in the books of the companies of only $3,158,275,156. Mr. Hulme said that when the reports are completed for all roads they will undoubtedly show a reproduction cost, even on the prices prevailing in 1914 and previous years, in excess of the carriers' own book costs, and that on the basis of present prices the total would be far in excess of the investment accounts, because present prices are over 100 per cent above those of 1914.

Mr. Hulme's testimony was presented over the protest of Clifford Thorne, representing a large number of shippers, and Glenn E. Plumb, who appeared for the railroad labor organizations. Mr. Thorne asked that the director of the Bureau of Valuation and the commission's chief counsel be present if the testimony were to be allowed, and said it was "outside of the record." Chairman Clark said the commission was authorized by the transportation act to avail itself of its valuation data in determining the aggregate value and Mr. Prouty and Mr. Farrell were not called in.

Mr. Hulme said the Bureau of Valuation has issued 55 tentative reports but that they are principally for small roads, only nine of them being Class I roads, but that it had tendered informally to the railroads for their suggestions and criticisms a large number of preliminary engineering, land and accounting reports for the purpose of seeking agreements as to questions of fact. The engineering reports included 41 Class I roads, whose figures he added to those for the nine Class I roads covered by the tentative valuations. For 30 of these there were also land reports and for 11 there were no land reports but he had used instead the original cost of land as stated in the reports of the roads.

For the first nine Class I roads, on which tentative valuations were served, the cost of reproduction including land was reported at $242,549,825, as compared with a total property investment account of $344,579,273. But for the 41 roads on which preliminary reports are available, the cost of reproduction plus land is reported at $2,961,187,718, as compared with a property investment account of $2,813,695,883.

The comparisons made by Mr. Hulme for the 50 Class I roads are shown in the tables on the following page.

Mr. Hulme pointed out that these government preliminary reports covered a number of roads recently in receivers' hands, and very few of the larger and stronger companies.

"When you take into consideration," he said, "that a number of roads first investigated by the commission were either at that time or shortly before in the hands of a receiver, and that with but few exceptions there are not included in these valuations any of the larger and stronger companies, and that the totals for the preliminary reports are in excess of the road and equipment accounts, whereas the results for the so-called tentative valuations which represented the earliest work of the commission were less than the road and equipment accounts, it seems to me that the conclusion would naturally be drawn that, for the country as a whole, the engineering inventories and land reports when finally determined will result in a figure in excess of the road and equipment accounts."

In a few words, Mr. Hulme's testimony showed, the reproduction cost falls considerably short of equalling the property investment figure on the books of the carriers, but these deficits are more than made up by the roads showing the higher inventory figures.

The preliminary reports, Mr. Hulme asserted, are minimum figures, and in a number of cases the carriers believed that final figures would be considerably larger. On this point he said: "Wherever there is a difference of opinion between the local engineering forces of the government and the representatives of the carriers, the government engineers put in the figures that they deem to be the minimum, so that the supervising officers of the Bureau of Valuation in Washington may have the opportunity in the first instance to consider the claims of the carriers as to what additional amount should be allowed. In such large inventories involving such great amounts it is but natural that there should be some errors and numerous differences of opinion, which, when considered, result in material increases in the total of the inventories as first tendered to the carriers. Aside from questions of fact which are individual to a carrier, there are great differences now existing between all the representatives of the railroads and the representatives of the Bureau of Valuation as to costs of grading, tracklaying and surfacing, general expenditures and interest during construction."

Commissioner Eastman pointed out that the excess of cost

EASTERN GROUP

Tentative Valuations

Carrier	Cost new	Land	Cost new and land	Investment in R. & E.	Miles of road
Elgin, Joliet & Eastern	$36,418,605	$3,386,896	$39,805,501	$38,683,120	227
Chic. T. H. & S. E.	22,247,890	1,017,415	23,265,305	24,927,762	363
Sub-total	$58,666,495	$4,404,311	$63,070,806	$63,610,882	590

Preliminary Reports

Ann Arbor System	$12,857,069	$683,720	$13,540,789	$18,741,167	354
Bangor & Aroostook	24,784,867	615,563	25,400,430	23,363,164	574
Boston & Maine System	231,775,788	44,752,340	276,528,128	195,903,526	2,295
Montpelier & W. R.	1,937,229	75,551	2,012,780	1,124,320	42
Central New England	15,483,002	1,911,772*	17,394,774	22,342,396	136
Hartford, Connecticut West	5,037,461	669,632*	5,707,093	4,386,613	124
Chicago & Eastern Ill.	72,331,056	5,420,799	77,751,855	78,990,280	1,225
Chicago, Indianapolis & Louisville	27,782,784	2,122,271	29,905,055	37,225,990	509
C. C. C. & St. L.	143,779,304	15,490,541	159,269,845	144,375,812	1,687
Maine Central System	64,925,379	2,214,567*	67,139,946	54,983,162	1,132
Portland Terminal	5,253,647	2,601,268	7,854,915	5,138,223	23
N. Y., N. H. & H.	248,599,023	71,000,000*	319,599,023	195,505,844	1,252
Toledo, St. L. & Western	16,746,019	1,700,149	18,446,168	39,381,687	450
Pere Marquette	65,324,361	4,603,567	69,927,928	87,100,297	1,792
Vandalia	42,351,590 }	6,060,896	51,858,294	{ 36,366,572	651
Terre Haute & Peoria	3,445,808 {			} 6,267,319	138
Sub-total	$982,414,387	$159,922,636	$1,142,337,023	$951,196,372	12,384
Total—18 valuations and preliminary reports	$1,041,080,882	$164,326,947	$1,205,407,829	$1,014,807,254	12,974

*Carriers' return to Order No. 7.

SOUTHERN GROUP

Tentative Valuations

Carrier	Cost new	Land	Cost new and land	Investment in R. & E.	Miles of road
A. B. & A. Sys.	$25,114,141	$2,357,676	$27,471,817	$39,255,787[1]	663
Geo., Sou. & Florida	10,297,657	1,231,456	11,529,113	12,273,374	392
Norfolk Southern Sys.	24,076,990	3,010,888	27,087,878	30,617,459	902
Winston-Salem Southbd.	5,428,444	510,655	5,939,099	5,598,558	90
Sub-total	$64,917,232	$7,110,675	$72,027,907	$87,745,178	2,047

Preliminary Reports

Central of Georgia	$62,252,124	$11,357,324	$73,609,448	$62,003,324	1,489
Southwestern R. R.	9,170,145	1,769,732	10,939,877	5,191,100	333
Charleston & West. Car.	9,814,315	1,875,745	11,690,060	8,279,563	341
Florida East Coast	43,557,372	4,409,548	47,966,920	48,207,859	739
Mobile & Ohio	47,027,163	3,908,595	50,935,758	45,897,658	923
N. C. & St. L. Sys.	56,309,554	4,857,487	61,167,041	42,066,246	1,100
New Orleans Gt. Nor.	7,298,789	208,825	7,507,614	16,045,669	243
Southern Ry. in Miss.	4,881,786	564,783	5,446,569	610,656	237
Gulf & Ship Island	9,498,259	1,354,196	10,852,455	14,170,083	308
Ga. R. R. & Bank, inc. Ga. R. R. (Lessee org.)	14,041,901	102,493	14,144,394	5,430,000	301
Sub-total	$263,851,408	$30,408,728	$294,260,136	$247,902,158	6,014
Total—14 tentative valuations and preliminary reports	$328,768,640	$37,519,403	$366,288,043	$335,647,336	8,061

[1]Investment as of December 31, 1915, after reorganization—taken from I. C. C. statistics.

WESTERN GROUP

Tentative Valuations

Carrier	Cost new	Land	Cost new and land	Investmeat in R. & E.	Miles of road
New Orleans, Tex. & Mex.	$8,865,636	$141,686	$9,007,322	$15,780,645	173
Kansas City Southern Sys.	46,732,105	4,530,642	51,262,747	101,050,970	879
San Pedro, Los A. & S. L.	43,127,960	4,098,083	47,226,043	76,391,598	999
Sub-total	$98,725,701	$8,770,411	$107,496,112	$193,223,213	2,051

Preliminary Reports

Arizona Eastern (inc. Phoenix & Eastern)	$12,178,415	$778,654	$12,957,069	$19,227,648	374
Rock Island System	342,830,396	45,770,812	388,601,208	341,401,305	7,686
Grand Canyon Ry.	1,365,674	6,267	1,371,941	1,988,785	64
M. St. P. & S. S. M.	108,066,929	6,634,182*	114,701,111	116,953,635	3,144
Northwestern Pacific	37,461,314	691,879*	38,153,193	65,984,697	506
Duluth, South Shore & Atl.	19,231,742	939,096	20,170,838	48,167,021	539
Mineral Range R. R.	3,230,437	113,582*	3,344,019	3,317,151	64
St. Louis Southwestern Sys.	60,845,317	5,823,190	66,668,507	94,250,627	1,579
Spok. Port. & Seattle	55,906,902	6,093,285*	62,000,187	61,266,414	498
Texas & Pacific	66,290,979	1,127,432*	67,418,411	109,250,903	1,853
Trinity & Brazos Valley	10,528,256	499,638	11,027,894	11,792,807	303
Western Pacific	60,817,087	6,122,412	66,939,499	86,985,845[1]	939
Great Northern	378,204,335	40,000,000	418,204,335	384,273,853	7,090
O. W. R. R. & N. Co.	123,490,128	19,857,000*	143,347,128	156,642,559	1,999
Oregon Short Line	107,018,378	2,666,841*	109,685,219	113,094,103	2,129
Sub-total	$1,387,466,289	$137,124,270	$1,524,590,559	$1,614,597,353	28,767
Total—18 valuations and preliminary reports	$1,486,191,980	$145,894,681	$1,632,086,671	$1,807,820,566	30,818

*Carrier's return Order No. 7.
[1]Investment as of December 31, 1917—after reorganization—taken from I. C. C. statistics.

SUMMARY

	Miles of road	Cost new	Land	Cost new and land	Inv. in R. & E.
(Nine) tentative valuations	4,688	$222,309,428	$20,285,397	$242,594,825	$344,579,273
(Forty-one) preliminary reports	47,165	2,633,732,084	327,455,634	2,961,187,718	2,813,695,883
Grand total (50)	51,853	$2,856,041,512	$347,741,031	$3,203,782,543	$3,158,275,156

CLASS I CARRIERS

No. of carriers	Group	Cost new	Land	Cost new and land	Inv. R. & E.
18	Eastern	$1,041,080,882	$164,326,947	$1,205,407,829	$1,014,807,254
14	Southern	328,768,640	37,519,403	366,288,043	335,647,336
18	Western	1,486,191,990	145,894,681	1,632,086,671	1,807,820,566
Total 50		$2,856,041,512	$347,741,031	$3,203,782,543	$3,158,275,156

of reproduction over book investment for the New England roads would more than offset the total excess.

M. P. Blauvelt, vice-president of the Illinois Central, testified in detail regarding the basis of compilation of the statistics for the Southern lines, showing a need of an increase of 31 per cent in freight revenues to put them on a 6 per cent income basis, and C. R. Capps, vice-president of the Seaboard Air Line, described the proposed adjustment of the rates.

Revised Figures for Southern Lines

The carriers in Southern classification territory called the attention of the commission to the fact that in their application for increase of revenue as filed it is stated that the property investment of the carriers amounts to $2,283,990,948. Since the preparation of this application and accompanying exhibits it has been found that the property investment account of the carriers for whom statistics were compiled is erroneous, in that this total property investment is shown by the books of the carriers to be $2,267,484,847, an item of $16,506,101 expended for additions and betterments prior to 1907 but not in fact charged to the investment account having been in error included in the compilation.

This change made it necessary to revise the exhibit attached to the application as follows:

REVISED STATEMENT

Property investment	$2,283,990,948
Deduct item erroneously included	16,506,101
	$2,267,484,847
Six per cent on property investment (revised)	136,049,091
Net railway operating income—adjusted	16,269,429
Deficit under 6 per cent	119,779,662
Total operating revenues—finally adjusted	581,768,519
Freight revenue	390,199,595
Passenger revenue	149,132,003
Express revenue	12,749,147

Increase needed applied to:

	As shown in petition	As corrected
Total operating revenues	20.759%	20.588%
Freight, passenger and express revenues	21.875	21.696
Freight and express revenues	29.972	29.726
Freight revenue only	30.951	30.697

S. M. Felton, president of the Chicago Great Western, on May 27 opened the presentation for the Western lines that are asking an increase of 24 per cent.

S. M. Felton Describes Need for More Railway Facilities

An abstract of Mr. Felton's statement follows:

In order to provide a return of 6 per cent upon the property investment of the lines in Western Classification territory an increase of approximately 17 per cent in gross revenue is required, and this is equivalent to an increase of approximately 24 per cent in freight revenue.

It is essential to the welfare of the American public that the production of its agricultural, manufacturing, mining and other industries shall be substantially increased from year to year. This increase of production must be greater in proportion than the increase in population. In a country having the geographical and topographical characteristics of the United States the needed increase in production is almost absolutely dependent upon a corresponding increase of railroad transportation. The farmer cannot continue to increase his crops; the coal mine operator cannot long increase the output of his mine; the manufacturer cannot increase his output, unless they can get constantly increasing railroad transportation. Until within comparatively recent years the increase in the capacity of our railroads normally kept pace with the increase in the country's productive capacity. There were times when the growth of the railways outstripped the growth of the productive capacity of the country, and this has been in the past particularly true in the territory west of the Mississippi river. This condition, however, no longer exists.

Dealing with the country as a whole, the statistics of railways as compiled by the commission corroborate what is a matter of general knowledge—that while in the decade between June 30, 1903, and June 30, 1913, the increase in the facilities of the railways was about in proportion to the increase in freight traffic handled by them, while the growth in facilities since that date has fallen far short of keeping pace with the increase in the tonnage actually handled. Data showing the growth and amount of railroad traffic handled reflect the fact that there has been an enormous increase in the productive capacity of the country within recent years. But they do not tell the whole story, because I think it may be safely said that at no time within the last three years have the railways been able satisfactorily to handle all the traffic which the industries of the country have offered them when the industries have been working anywhere near to their capacity. The result has been that in all periods of large production there have been complaints from the large producing industries. Many of these complaints have been only too well founded. In 1915 the actual production of bituminous coal was 442,684,000 tons, in 1916 it was 502,520,000 tons, in 1917 it was 552,000,000 tons, and in 1918 it was 579,500,000 tons. In spite of this large increase the coal mine operators constantly complained in 1917 and 1918 that their production was restricted by shortage of cars. The Statistical Abstract of the United States shows the steel production of the country in 1913 to have been 31,301,000 tons. In 1917 this was increased to 45,061,000 tons, and in 1918 it was 44,462,432 tons. While the steel mills were able to secure this large production there is little doubt that they could have secured still larger production if they had been able to obtain all the transportation they needed. The acreage devoted to the growth of staple agricultural products showed a large increase during the war. In 1913 the acreage devoted to these crops was 258,500,000; in 1916, 271,000,000, and in 1918, 288,500,000. The increase in 1918 over 1916 was 6 per cent and in 1918 over 1913, 11 per cent.

The farms of the country today have a greater productive capacity than they ever had before. The bituminous coal mines can produce at least 700,000,000 tons annually, or about 20 per cent more than they ever have produced in the past. The Iron Age, in a recent issue, estimated the steel ingot producing capacity of the steel mills of the country as now "well above 50,000,000 tons a year" and perhaps as much as 55,000,000 tons.

It is impossible to obtain reliable statistics as to the present productive capacity of most of our large industries, but in almost all cases where such information is obtainable it shows that large increases have taken place since pre-war days and that such increases are still continuing. On the other hand, very little has been done even since 1918 to increase the capacity of the railways. The number of miles of railway abandoned during the last three years has been greater than the number built. The number of locomotives and freight cars ordered during the more than two years of government control would barely suffice to replace the number ordinarily retired in a year. The Interstate Commerce Commission's statistics show that there was an actual decline of 206 in the number of locomotives in service in 1918 and an increase of only 1,425 in the number of freight cars; and when the statistics for 1919 are available they doubtless will show that in that year there was a further decline in the number of both locomotives and freight cars. During government control not a single passenger car was ordered. The already great disparity between the productive capacity of the country and its railroad capacity is continuing to increase.

The effects of the inadequacy of railroad transportation ramify throughout our entire industrial and financial system. There is but one way to remedy this condition and prevent the disastrous results to which an aggravation or even continuance of it would lead. This is to make large investments in railroads attractive.

Turning now to the west we find that the period between

1901 and 1916, like earlier periods, was a period of great expansion in railroad facilities. Statistics compiled for the 46 principal roads or systems in the west for use in the fifteen per cent case in 1917 show that while the tons carried one mile increased 69 per cent during this period and the passengers carried one mile increased 67 per cent, the net cost of road and equipment increased 73.1 per cent. These figures indicate that it was the general policy of the lines in the west during this period to provide facilities in advance of the requirements of commerce and let the business grow up to them. Since 1911 it is possible to compare the growth in traffic and facilities by districts through the use of the annual statistics of the commission. These show a slowing down of the policy of expansion in the later years of the pre-war period and a further marked arrestment of development during the war period because of war conditions.

These figures would seem to indicate, first, that in the decade from 1901 to 1911 the expansion of railroad facilities in the west was in advance of the expansion of industry, as it should be, in this territory of large expanse and great possibilities of development; second, that in the years immediately succeeding 1911 the growth in railroad facilities lagged behind the growth in commerce; and, third, that at the present time the business of the western lines is fully up to or beyond the limit of their capacity. The latter conclusion is reinforced by an analysis of the growth in facilities as expressed in terms of single-track mileage, yards, sidings and equipment up to December 31, 1916, as related to the growth in traffic and the lack of growth in these same facilities since that date.

The annual budget of any company for improvements is considerably over 100 per cent in excess of that required for the same amount of work in the pre-war period. Furthermore, the curtailment of construction and improvement work during the war and in the few years immediately preceding it make it imperative that an improvement budget, as expressed in units of property to be added to the existing plant, should greatly exceed the normal budget of prior years.

Money for these purposes must be raised at interest rates of 7½ to 8 per cent, as compared with rates ranging from 3½ to 5 per cent in the period from 1901 to 1916, or must be contributed by appropriations from income which when made will purchase less than half as much as in prior years, and in the matter of freight cars about one-quarter as much. The average return on property investment from 1901 to 1916, as shown by the exhibits offered in the fifteen per cent case, was about 5 per cent. It will scarcely be contended that the earnings of lines in Western Classification territory were excessive during this period. In view of the increased return on capital in other lines of industry, increased interest rates, increased cost of all elements entering into railroad construction, it is earnestly urged that a return of 6 per cent upon a principal sum similarly stated, namely, in terms of the property investment of the carriers, is no greater than the necessities of the case demand and is in fact less than might be appropriately allowed but for the limitations of the statute.

The construction of a large amount of new mileage is needed in the western territory. It is hardly necessary to emphasize that this new mileage will not be built unless there is a fair prospect of a reasonable return being earned upon the additional investment and that the prospect of a return being earned upon such investment will depend upon the relationship between the general level of operating expenses and rates.

Many people seem to have the impression that most of the territory west of the Mississippi river, except those parts which are regarded as being desert, are fairly well provided with railroad facilities. It is true that this territory contains about 142,000 miles of railway, or more than one-half the mileage of the country, but in proportion to its area and its natural resources its railroad mileage is still small. There is needed not only an increase in the carrying capacity of the railways, but the construction of a large amount of additional mileage to enable new sources of agricultural products, of minerals, oil, lumber and so on to be opened up. This kind of development is needed not merely for the benefit of the west but of the entire country and of the world, for it will contribute toward that increase of general production which is needed to provide mankind with additional necessities and comforts and to reduce the cost of living.

Within recent years not only has new construction in that territory almost ceased, but the statistics of the Interstate Commerce Commission show that in the year ended December 31, 1917, the mileage of railway in eight states west of the Mississippi river declined. It can hardly be regarded otherwise than as ominous that in the newest part of the country, where the undeveloped areas are largest, there should be going on, not an extension, but an actual decline, in railroad mileage.

The construction of new railroads as a speculative venture is practically a thing of the past in this country. Existing railway companies must be relied upon to provide practically all the new mileage. They will be unable to raise capital unless they are given rates which will yield a reasonable return—which is certainly not less, under existing conditions, than 6 per cent—upon both the investment in their existing properties and upon any additional investment they may make in new lines. In fixing rates the transportation act requires the Interstate Commerce Commission to consider the need of the American public for adequate transportation. No one will question that in making this requirement Congress had as much in mind the need of the public for the construction of new lines to help make available to the public the undeveloped resources of the country as it did the need for expansion of the facilities of the railway lines which already are in existence.

It has been impliedly suggested in cross-examination that the percentage of advance in this case should be cut down by the commission on the theory that the carriers' net revenue may be increased through operating economies or by increase in traffic.

As a railroad man I should not like to think that the limits of operating economies or progress in operating efficiency have been reached. It must be borne in mind, however, that in the past economies in operation have been effected primarily through grade reductions, use of heavier power, larger cars and other improvements in the plant itself and that the opportunities for further progress in this direction are constantly diminishing.

Taking the plant as it stands today, and labor and operating conditions as they now exist if traffic remains normal, it is my opinion that no substantial reductions in operating expenses can be looked for in the immediate future, and it is to the immediate future that this case relates. When the credit of the roads is restored and they are able to secure the necessary funds, the program adopted before the war by many of the lines of substituting heavy power for light, of reducing grades wherever the traffic movement justified such reduction, of substituting new modern appliances for old will be resumed, and in course of time results will be secured, but nothing substantial can be accomplished in the immediate future.

Whether the volume of business handled will increase or decrease is purely a matter of speculation. We are in a period of uncertain industrial conditions which may decrease as well as increase the volume of traffic handled. Any increase in net operating revenues which may result from increased business may be met by subsequent action.

There is one thing certain in the immediate future, and that is the pressing need for enormous additional capital expenditures, upon which, as well as upon the present value of their

properties, the carriers are entitled to a fair rate of return as defined in the statute, and for which no calculation has been made in the figures submitted.

The first requirement of the situation is that the carriers should be assured, as nearly as may be, of such adequate return as will make it possible for them to finance and provide these facilities. The commission cannot with safety regulate its judgment in this case by assumptions either as to increased business or decreased cost.

L. E. Wettling, statistician for the Western lines, followed Mr. Felton on May 28 with a detailed explanation of the statistical exhibits. Commissioner Woolley objected to a statement made by the witness regarding the increases in wages as a reflection on the government control and as indicating that a different situation might have resulted under private ownership, but F. H. Wood of the Southern Pacific said that no reflection was intended and no comparison. It was merely the purpose to give the best evidence of the present level of revenues and expenses. Chairman Clark remarked that Congress had had something to do with the level of wages during the guaranty period.

Edward Chambers, vice-president of the Atchison, Topeka & Santa Fe, testified on the traffic aspects of the case. He said a failure to make a uniform advance in both state and interstate rates would have a very serious effect in creating discriminations. In describing the proposed interterritorial adjustments he said that it was proposed to increase transcontinental rates from points west of Chicago to the Pacific coast by 25½ per cent because the Eastern lines insist on having a 30 per cent increase in their present divisions. A similar percentage is proposed on transcontinental rates from the Southeast. On rates from the East to St. Paul and Duluth it is proposed to make the increase 27 per cent.

As to switching rates, Mr. Chambers said it was the original understanding of the traffic men that they were to be included in the advance, but the accountants in compiling the figures had used the technical interpretation of freight revenue. Because of the lack of uniformity in switching rates it was then thought advisable to readjust them after the general increase is made, and this plan was favored by the National Industrial Traffic League Committee.

As to grain rates it is proposed to work out the same relationships that are now in effect and the tariffs will be ready shortly, but the coal adjustment is not yet completed. The intention is to get the full percentage increase on coal, and oil will be increased on a percentage basis.

Commissioner Aitchison made the point that there had been less increase in passenger fares in the west because in many parts of the country they were already on a three-cent or higher basis when rates were advanced to that figure generally.

Southwestern Lines Ask Higher Increase

Columbus Haile, chief traffic officer of the Missouri, Kansas & Texas, testified on behalf of the Southwestern lines that have asked that they be placed in a separate statutory group and given a general rate advance of 32.82 per cent, or at least that they be given special consideration in the adjustment of the rates, because the 24 per cent asked by the Western lines generally is inadequate for the Southwestern group. The Southwestern lines had joined in the general application filed by the Western lines, but felt that their conditions and the fact that Southwestern Tariff Committee territory has for many years been a well-defined rate territory justified them in asking special consideration. Chairman Clark had written a letter saying that the commission desires to consider Western Classification territory as one group, but that it may develop that in distributing the amount of revenue authorized it will be found appropriate to increase certain sets of rates more than certain other sets are increased.

R. C. Fulbright and S. H. Cowan, representing Texas shippers, objected to any segregation of the Southwestern lines. Mr. Haile said that if they were allowed 33 per cent the increase for the other Western lines would be reduced about 2 per cent and that the Southwestern lines would require about $90,000,000 of the proposed increase of $353,000,000 for the western territory.

H. A. Cochran, assistant coal traffic manager of the Baltimore & Ohio, explained the proposed adjustment of ex-lake iron ore rates, which is intended to give the carriers south of the lakes both the new increase and the amount of the increase under General Order No. 28 which was not allowed them.

Additional Information Desired

At the conclusion of the hearing Chairman Clark read a list of 12 requests for additional statistical information to clear up some points which were left uncertain by the testimony and also to bring the statistics more nearly up to date by showing the results of operation for March and April of this year if possible. The questions called for a more detailed analysis of the property investment accounts, separated as to road and equipment, improvements to leased lines, and materials and supplies, and a hint that the commission is giving some consideration to the possibility of an increase in commutation fares, which have been increased less than ordinary fares, and to a surcharge for Pullman passengers, was seen in a question as to the amount of revenue that might be affected by such charges. The commission also asked exact information as to the extent to which it is proposed to increase switching charges.

W. E. Lamb, on behalf of the representatives of the shippers, also submitted a list of questions which the commission said the roads might answer, providing they could do so reasonably within the time available. These dealt principally with the equipment situation and asked for the number of cars and locomotives turned over by the railroads to the Railroad Administration and turned over by it to the railroads on February 29, the number of cars purchased by it and allocated to the various roads, the number of bad-order cars and locomotives at the beginning and at the end of federal control, the cars in shop at the end of federal control and the number repaired since, the cars retired during federal control, whether the need for equipment is due to the condition of maintenance during federal control or to increase in traffic, the percentage of car shortage now and at the end of federal control, and what causes prompted the carriers to ask the commission "to take over car distribution;" also the facts as to the compliance by the railroads with the car service rules or the directions of the Commission on Car Service since federal control.

F. H. Wood on behalf of the carriers, asked the commission to decide as to the relevancy of the questions and as to whether they should be answered. Chairman Clark said that unless they involved an undue amount of special investigation they should be answered, except that those which called for conclusions might better be put to individual witnesses than to a committee or an association.

In reply to a question submitted earlier in the hearing, George M. Shriver, vice-president of the Baltimore & Ohio, submitted a compilation on behalf of the eastern roads showing that the excess earnings over 6 per cent subject to recapture from individual roads, on the basis of their property investment, would be about $104,000,000, of which one-half would go to the government. He said, however, that he had not much confidence in the estimate.

The program for the balance of the hearing after the recess is as follows:

June 7—General cross-examination of railroad witnesses, in the order in which they have already appeared, as to revenues and expenses, valuation and other general financial

matters; also general questions of traffic policy, such as switching charges and interterritorial rates.

June 10—The state commissions; National Industrial Traffic League; other general testimony by shippers.

June 14—Coal and coke.

June 15—Grain and grain products; live stock and packing-house products.

June 17—Brick, cement, stone and gravel; oil.

June 19—Lumber and forest products.

June 21—Fruits and vegetables.

June 22—All others, followed by oral argument.

Clifford Thorne will handle the principal cross-examination for the shippers on the question of value and the statistical testimony.

Report on Riverside (Vermont) Collision

THE INTERSTATE COMMERCE COMMISSION has issued a report, dated April 16 and signed by W. P. Borland, chief of the Bureau of Safety, on the butting collision at Riverside, Vt., on the Rutland Railroad, March 14, in which 10 persons — 5 passengers and 5 employees — were killed and 32 were injured. Northbound passenger No. 165 and southbound freight extra 28 met, about 4:49 p. m., when both trains were moving at good speed. The locomotives, eight freight cars and three cars in the passenger train were wrecked. Among the killed was Engineman Cady of the freight. The collision was due to the misreading of a train order on the part of the men in charge of the freight train, which order was delivered to them at Gassetts, about 15 miles north of the point of collision. The order stated that the passenger would wait for them at Bartonsville, about seven miles north of Riverside, until 4:50 p. m.; but they took it to mean that it would wait at Bellows Falls, which is two miles beyond the point of collision.

The order, as received at Gassetts, was on form 19 and was delivered by the station operator to the fireman on the freight locomotive as it passed his office, and to the conductor on the caboose by means of a hoop. The fireman testified that the operator, in handing up the order said, "Wait at Bellows Falls until 4:50; I haven't got time to make out a clearance; that is all there is; go ahead." The order was handed to the engineman and he read it aloud to the fireman and to the head brakeman, reading "Bellows Falls." The fireman said that it was the engineman's usual practice, after reading an order, to hand it to the fireman and to the head brakeman, but that he did not do so on this occasion. Under the rule the fireman ought to have read the order; and on seeing it at the time of the investigation he thought that if he had read it he would have done so correctly.

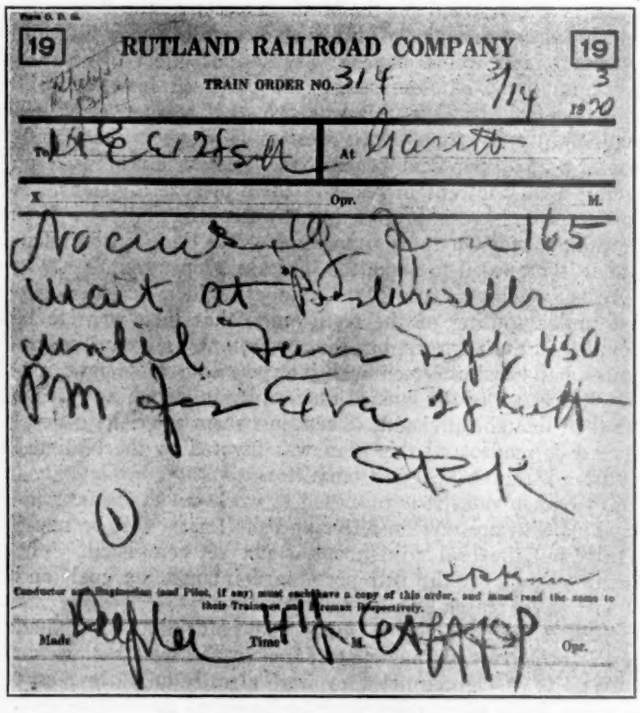
The conductor on the freight thought the order read Bellows Falls, and he handed it to the flagman; and after discussing it, the flagman agreed with the conductor as to its contents. .

The order was No. 414 and it read "No. one sixty five 165 wait at Bartonsville until 4 50 pm for Ex. 28 south." The order as delivered to the freight is shown in the illustration reduced in size. This is copied from the government report. The number, "314," was put on by mistake; the operator testified that in repeating the order this mistake was corrected but that in his hurry he neglected to change the "3" to "4."

The testimony of the conductor of the freight seems to indicate that from the first he doubted the reading of the word "Bartonsville"; and yet, after taking a second look, at Bartonsville, and conferring with the flagman he decided that the obscure word was Bellows Falls; and the assumption that the engineman, more experienced than the conductor, had read it and would act correctly, seems to have been the principal ground for this conclusion. The fact that the engineman passed Bartonsville was enough to lead the conductor to be willing to pass that point. The conductor had never worked with this engineman before. He had made 32 trips as conductor and this was his first trip on this section of the road; though he had been over it frequently as brakeman and baggageman. This conductor had said to the conductor of the passenger train, immediately after the collision "I couldn't quite figure out where you were to wait for us." He had told the assistant superintendent, at an earlier investigation, that he and the flagman had agreed that the station named in the order must be Bellows Falls.

Operator Spafford denied having said anything to the fireman about the contents of the order. He said that the engineman was familiar with his handwriting and, he, Spafford, had frequently issued orders to him during the past five years.

The report, in attributing the collision to the failure to


19 RUTLAND RAILROAD COMPANY 19

TRAIN ORDER NO. 314 3/14 3 1920

To Extra 28 South At Barretts

X Opr. M.

No. 165 wait at Bartonsville until 4:50 PM for Extra 28 South

Conductor and Engineman (and Pilot, if any) must each have a copy of this order, and must read the same to their Trainmen and Fireman Respectively.

Made Time M. Opr.

correctly read the order holds responsible not only the conductor and engineman but the flagman, the fireman, and the head brakeman, who, according to the rules should read all such orders. Mr. Borland believes that if the engineman had read the order with care he would not have made the error, notwithstanding the illegibility of the writing. It is possible, however, that he heard the remark made by the agent to the fireman. [This remark the agent denied making.]

Referring to the evident condition of doubt in the conductor's mind, the report finds him grossly negligent in failing to stop his train at Chester, the last open telegraph office, for the purpose of finding out exactly what rights he had.

Engineman Cady had been in the service 28 years and a runner 20 years; and had been held responsible for four collisions. Since April, 1916, however, his record was clear. The agent (operator) at Gassetts, Spafford, had been in the service 40 years, and agent at Gassetts 33 years, and had an excellent record.

The report concludes with a recommendation that the block system be installed.

Experiments Give Data on Embankment Shrinkage

Results Obtained by the Burlington Confirm the Prevailing Understanding of This Matter

BECAUSE of the apparent lack of any specific data on the subject of shrinkage in embankments other than the allowance in construction of the customary 10 per cent, the valuation department of the Chicago, Burlington & Quincy undertook a series of experiments to determine the actual shrinkage of the material used in embankments on the lines of the Burlington, these experiments following what is known as the density method. For the purpose of avoiding any confusion as to the interpretation of the term "shrinkage" the following definitions have been used to designate the significance of the word "shrinkage" as employed in these experiments:

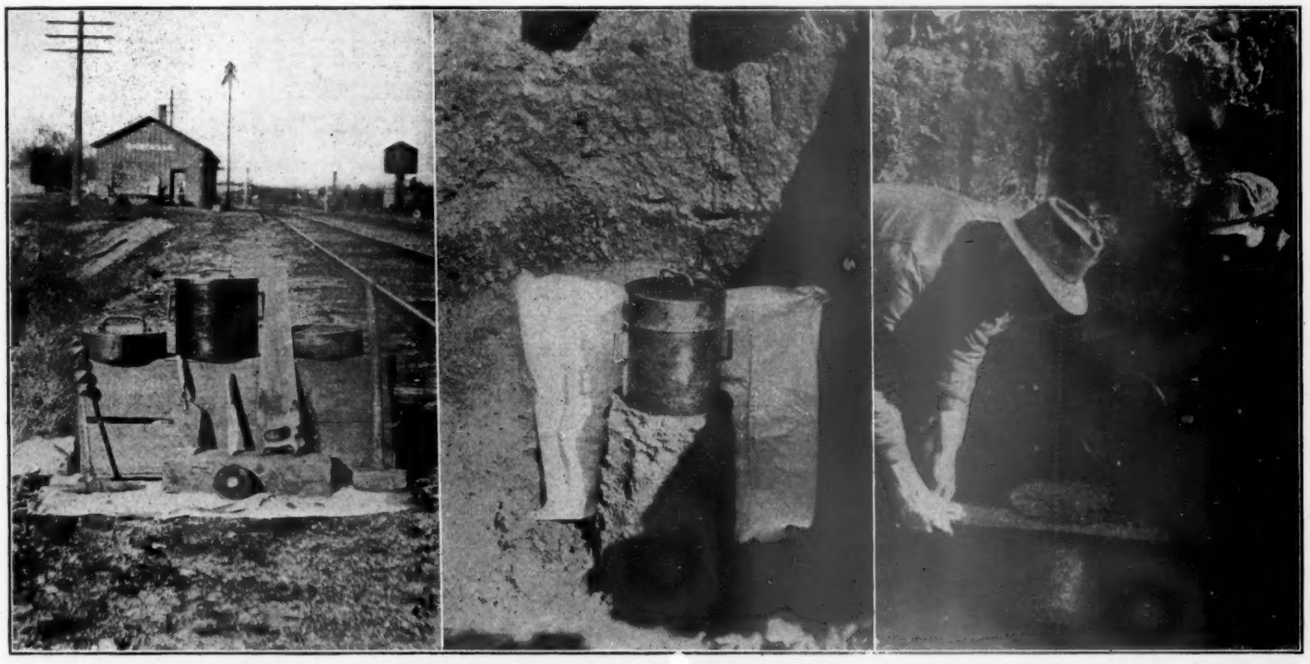
Net shrinkage as herein considered is taken as the lessening in volume of earth as between its formation in the natural bed and its re-formation in the embankment. It is a characteristic presumedly due to the breaking up for movement and the solidification in new position under the influence of its own weight and the effects of superimposed loading and impact.

Gross shrinkage involves, in addition to the net shrinkage, the loss during construction and prior to acceptance for operation by wastage on runways and the erosion by the natural elements; also the slight unmeasured general subsidence which obviously occurs under all embankments built upon glacial drift or arable soil.

The density method of determining shrinkage consists of a comparison of the weights of the net metallic contents of equal sized, unmolested samples of a given kind of earth taken from the embankment and from the natural bed adjacent to the excavation from which the embankment was made. The net metallic content is taken to be the weight of the sample after drying—the moisture content being eliminated by heat. The difference in weight is taken as the measurement of the change in volume.

How the Samples Were Taken

The samples of earth for these studies were taken at points where it could be said or where it was reasonable to suppose that a particular embankment was made from a certain excavation. Geographically, the sampling covered the territory of northern Illinois, northern Missouri and southern Iowa. With possibly some exceptions of points along or close to rivers, the samples are representative of soil said by geologists to have been formed by glacial drift, hence any conclusions concerning shrinkage developed by this investigation may be applicable only to glacial drift formation.



(Left) Apparatus and Tools Used—Driving Cap Cylinder with Neat Closing Cap and Soft Wood Driving Block. (Center) The Cutting Cylinder in Initial Position on Top of Rough Specimen of Earth in the Pit. (Right) Cylinder Completely Covering the Specimen. Driving Cap Removed and Protruding Earth Being Sawed Off

The position of a desired sample having been determined, a pit was dug to the top surface of the sample—the horizontal projection of the sample was roughly marked out in the center of the pit and the excavation continued down around the sample for about eighteen inches. The excavation at this stage presented a rough unmolested projection of earth about the size of the desired sample extending up from the bottom of the pit.

A special sample cutting cylinder was provided for the neat cutting of the sample. This apparatus consisted of a finished cylindrical shell 10 in. long and 10⅜ in. inside diameter. One end of the cylinder was threaded and fitted with a screw cap, the other end was beveled outside to a cutting edge of 1/64 in. Handles were attached to the cylinder and cap for convenient manipulation. A photograph shows this cylinder and the tools used in cutting out the sample.

TABLE 1—NET SHRINKAGE OF EARTH IN RAILROAD ENBANKMENTS—DENSITY METHOD

Excavation						Embankment							Weight per cubic foot			
						Sample Number	Location in fill						Excavation		Embankment	
Geographical location	Sample number	Vertical location in cut	Kind of soil (judgment)	Weight when received at laboratory	Weight after drying		Vertical	Hor.	Kind of soil (Judgment)	Weight when received at laboratory	Weight after drying	Fills less cut	Shrinkage, per cent	Per cent for addition to fill to obtain cut	When received at laboratory	After drying	When received at laboratory	After drying
Hastings, Ia.	2	4.5	Sandy yellow clay	100.75	83.7	1	5.0	17	Sandy yellow clay	101.50	89.7	6.0	6.70	7.17	100.75	83.7	101.50	89.7
Hastings, Ia.	2	4.5	Sandy yellow clay	100.75	83.7	3	4.0	6	Sandy yellow clay	109.25	96.1	12.4	12.90	14.81	100.75	83.7	109.25	96.1
Hastings, Ia.	2	4.5	Sandy yellow clay	*100.75	*83.7	4	5.0	5	Sandy yellow clay	*118.50	*96.9	13.2	13.62	15.77	100.75	83.7	118.50	96.9
Ohio, Ill.	5	4.0	Sandy yellow clay	*51.7	*45.6	6	5.5	6	Sandy yellow clay	*56.7	*46.5	0.9	1.94	1.97	105.5	93.1	115.7	94.9
Ohio, Ill.	9	1.0	50% black, 50% yellow	42.9	34.8	7	6.0	5	50% black; 50 yellow	55.7	45.2	10.4	23.01	29.89	87.8	71.1	113.6	92.2
Ohio, Ill.	10	4.5	Sandy reddish yellow clay	64.3	57.1	8	9.0	5	Sandy reddish yellow	64.5	58.6	1.5	2.56	2.63	131.2	116.5	131.6	119.6
Buda, Ill.	11	4.0	Sandy yellow clay	50.5	44.1	14	20.0	46	Sandy yellow clay	63.3	47.8	3.7	7.74	8.39	103.1	90.0	129.2	97.5
Buda, Ill.	12	21.5	Sandy red clay	64.5	58.0	..	...	..	.....	....	...	....	....	....	131.6	118.4	....	....
Buda, Ill.	15	23.0	Blue clay	68.6	61.0	13	7.0	19	Blue clay	66.0	58.6	—2.4	Swell 4.10	—3.93	140.0	124.5	136.7	119.6
Ottumwa, Ia.	19	17.5	33% blue; 67% yellow	57.8	49.8	16	7.0	6	33% blue; 67% yellow	61.2	53.3	3.5	6.57	7.03	118.0	101.6	124.7	108.8
Ottumwa, Ia.	17	15.0	33% gray; 70% yellow	56.7	49.0	18	7.0	6	30% gray; 70% yellow	62.2	52.9	3.9	7.37	7.96	115.7	100 0	126.7	108.0
Ottumwa, Ia.	20	10.0	70% gray; 30% yellow	62.3	54.8	21	7.0	6	40% gray; 60% yellow	63.9	54.7	—0.1	Swell 0.18	—0.18	127.1	111.8	130.4	111.7
Tingley, Ia.	23	9.0	10% gray; 90% yellow	63.8	56.4	22	5.0	6	10% black; 90% yellow	61.0	53.9	—2.5	Swell 4.62	—4.43	130.2	115.1	124.5	110.0
Tingley, Ia.	25	3.0	30% gray; 70% yellow	57.8	49.0	24	5.0	6	30% gray; 70% yellow	60.8	52.1	3.1	5.95	6.33	118.0	100.0	124.0	106.4
Tingley, Ia.	27	8.0	5% gray; 95% yellow	63.9	57.0	26	5.0	5	40% black; 60% yellow	60.7	51.2	—5.8	Swell 11.33	—10.17	130.4	116.3	123.8	104.5
Clair, Mo.	31	2.0	Black gumbo	53.1	41.5	28	4.0	4	Black gumbo	55.9	42.0	0.5	1.19	1.20	108.4	84.7	114.1	85.7
Clair, Mo.	32	3.0	Gray gumbo	55.9	46.1	29	4.5	4	Black gumbo	55.3	43.6	—2.5	Swell 5 73	—5.42	114.1	94.1	112.9	89.0
Clair, Mo.	34	2.0	Black gumbo	51.0	42.2	33	1.5	4	Black gumbo	57.0	46.1	3.9	8.46	9.24	104.1	86.2	116.4	94.1
Clair, Mo.	35	2.5	Black gumbo	54.5	41.2	30	3.0	4	Black gumbo	55.0	42.6	1.1	2.60	2.67	111.2	84.1	112.3	86.9
Cameron, Mo.	37	4.0	10% gray; 90% yellow	53.4	41.5	36	6.0	4	10% gray; 90% yellow	55.0	44.1	2.6	5.89	6.27	109.0	84.7	112.3	90.0
Cameron, Mo.	37	4.0	10% gray; 90% yellow	53.4	41.5	38	6.0	4	10% gray; 90% yellow	55.2	43.1	1.6	3.71	3.85	109.0	84.7	112.7	88.0
Cameron, Mo.	39	3.0	20% gray; 80% yellow	56.5	45.2	40	4.0	4	20% gray; 80% yellow	58.8	46.6	1.4	3.00	3.10	115.3	92.3	120.0	95.1
Biggsville, Ill.	42	26.0	Sandy yellow clay	62.5	54.5	41	5.0	4	Sandy yellow clay	64.7	57.3	2.8	4.89	5 14	127.6	111.2	132.0	117.0
Biggsville, Ill.	45	3.0	Sandy yellow clay	51.2	42.2	43	5.0	17	Sandy yellow clay	60.2	49.4	7.2	14.58	17.06	104.5	86.2	122.8	100.8
Biggsville, Ill.	45	3.0	Sandy yellow clay	51.2	42.2	44	7.5	4	Sandy yellow clay	59.4	49.9	7.7	15.43	18.25	104.5	86.2	121.3	101.8
Biggsville, Ill.	47	4.0	Sandy red clay	50.3	43.2	46	5.0	7	Sandy red clay	55.6	44.7	1.5	3.36	3.48	102.7	88.2	113.3	91.2
Melrose, Ia.	50	1.5	Black loam	49.5	39.0	48	3.0	4	Black loam	51.8	41.0	2.0	4.88	5.13	101.0	79.6	105.8	83.7
Melrose. Ia.	51	2.5	Sandy black loam	54.8	45.2	49	3.0	4	Black loam	54.8	42.9	—2.3	Swell 5.36	—5.09	111.8	92.3	111.9	87.6
Melrose, Ia.	54	2.0	Black loam	52.2	41.7	53	3.0	4	Black loam	54.7	39.6	—2.1	Swell 5.30	—5.04	106.7	85.1	111.7	80.8
Melrose, Ia.	55	1.0	Black loam	49.3	39.0	52	3.0	4	Black loam	54.6	42.7	3.7	8.66	9.49	100.6	79.6	111.5	87.1
Melrose, Ia.	57	1.0	Black loam	43.7	34.9	56	3.0	4	Black loam	50.5	38.9	4.2	10.80	12.04	89.2	73.7	103.1	79.4
Russell, Ia.	60	8.5	20% blue; 80% yellow	62.8	56.5	58	8.0	4	10% gray; 90% yellow	61.7	53.1	—3.4	Swell 6.40	—6.02	128.2	115.3	125.9	108.4
Russell, Ia.	63	7.0	60% blue; 40% gray	58.1	48.2	59	5.2	4	25% gray; 75% stiff yellow	61.9	54.3	6.1	11.22	12.66	118.5	98.4	126.3	110.9
Russell, Ia.	63	7.0	60% blue; 40% gray	58.1	48.2	61	8.0	4	100% blue clay	55.5	42.5	—5.7	Swell 13.41	—11.83	118.5	98.4	113.3	86.9
Russell, Ia.	63	7.0	60% blue; 40% gray	58.1	48.2	62	3.0	2	85% blue; 15% yellow	56.3	45.0	—3.2	Swell 7.11	—6.64	118.5	98.4	114.9	91.8
Thayer, Ia.	73	0.7	20% black; 80% yellow	49.3	38.9	66	10.0	14	12% black; 88% yellow	57.8	46.9	8.0	17.06	20.57	100.6	79.4	118.0	95.7
Thayer, Ia.	73	0.7	20% black; 80% yellow	49.3	38.9	70	13.0	9	20% black; 80% yellow	60.6	49.5	11.6	23.43	29.82	100.6	79.4	123.6	101.0
Thayer, Ia.	73	0.7	20% black; 80% yellow	49.3	38.9	71	13.0	14	30% black; 70% yellow	61.8	51.7	12.8	24.76	32.91	100.6	79.4	126.1	105.6
Thayer, Ia.	74	1.5	Sandy yellow clay	56.1	44.6	72	21.0	40	15% black; 85% yellow	56.1	46.1	7.2	15.62	18.51	100.6	79.4	114.5	94.1
Thayer, Ia.	74	1.5	Sandy yellow clay	56.1	44.6	65	7.0	9	Sandy yellow clay	58.7	47.5	2.9	6.11	6.50	114.5	91.0	119.8	96.9
Thayer, Ia.	74	1.5	Sandy yellow clay	56.1	44.6	67	10.0	9	Sandy yellow clay	59.4	48.3	3.7	7.66	8.30	114.5	91.0	121.3	98.6
Thayer, Ia.	74	1.5	Sandy yellow clay	56.1	44.6	68	10.0	4	Sandy yellow clay	58.7	48.0	3.4	7.08	7.62	114.5	91.0	114.5	97.9
Thayer, Ia.	75	2.3	Sandy yellow clay	56.1	44.6	69	13.0	4	Sandy yellow clay	59.1	49.3	4.7	9.53	10.54	114.5	91.0	120.6	100.6
Thayer, Ia.	76	3.0	Stiff yellow clay	59.3	49.2	64	7.0	4	Sandy yellow clay	59.9	49.5	0.3	0.61	0.61	121.0	100.4	122.3	101.0
Thayer, Ia.	77	5.0	70% stiff yellow; 30% gray	60.1	51.0	..	...	..	.....	....	....	...	....	....	122.5	104.1	....	....
Thayer, Ia.	78	7.4	80% stiff yellow; 20% gray	62.7	54.1	..	...	..	.....	....	....	...	....	....	128.0	110.4	....	....
Corning, Ia.	81	4.0	80% stiff yellow; 20% gray	64.4	56.0	..	...	..	.....	....	....	...	....	....	131.4	114.3	....	....
Corning, Ia.	81	4.0	80% stiff yellow; 20% gray	56.7	44.6	79	5.0	5	80% stiff yellow; 20% gray	55.5	42.2	—2.4	Swell 5.69	—5.38	115.8	91.0	113.3	86.1
Corning, Ia.	84	1.0	Black loam	56.7	44.6	80	6.0	5	80% stiff yellow; 20% gray	56.2	43.2	—1.4	Swell 3.24	—3.15	115.8	91.0	114.7	88.2
Corning, Ia.	85	1.0	Black loam	48.4	37.0	83	4.0	5	Black loam	54.2	40.3	3.3	8.19	8 92	98.8	75.9	110.7	82.2
Corning, Ia.	88	1.0	Black loam	47.2	34.7	82	5.0	5	Black loam	54.0	39.5	3.8	9.63	10.95	96.3	73.7	110.2	80.6
Corning, Ia.	89	1.0	Black loam	42.0	35.1	87	3.5	5	Black loam	53.9	39.8	4.7	11.81	13.39	85.7	71.6	110.0	81.2
				47.0	35.0	86	5.0	5	Black loam	53.8	40.1	5.1	12.72	14 57	95.9	71.5	109.8	81.8

Note:—Vertical locations in cuts are distances down from natural surface.
Vertical locations in fills are distances down from top of tie: Horizontal locations are distances from center of track.
*Changed test box from 1 cu. ft. to test box containing .49 cu. ft.

The sample cylinder, cutting edge down, was placed upon the earth projection and gently forced down over the sam-

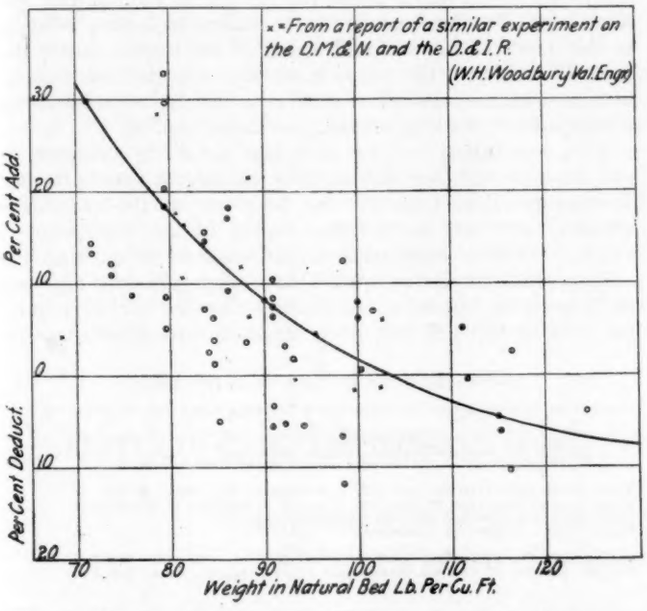


Fig. 1—Curve of Shrinkage, Volume in Embankment to Volume in Excavation

ple—the projection being dressed down ahead of the cutting edge so that it would have a minimum of work to do, and hence leave the sample in an undisturbed condition. A special driving cap permitted the core to pass entirely through the cylinder. After the cylinder was well down over the sample, the driving cap was removed and the protruding earth was sawed off true with the top of the cylinder. The cylinder was then capped with the neat closing cap—shovels were inserted in the earth projection below and clear of the cutting edge and the cylinder and the bulk projection broken loose from its contact and inverted. The protruding earth on the now upturned lower end of the cylinder was then sawed off true with the cutting edge and the work was completed.

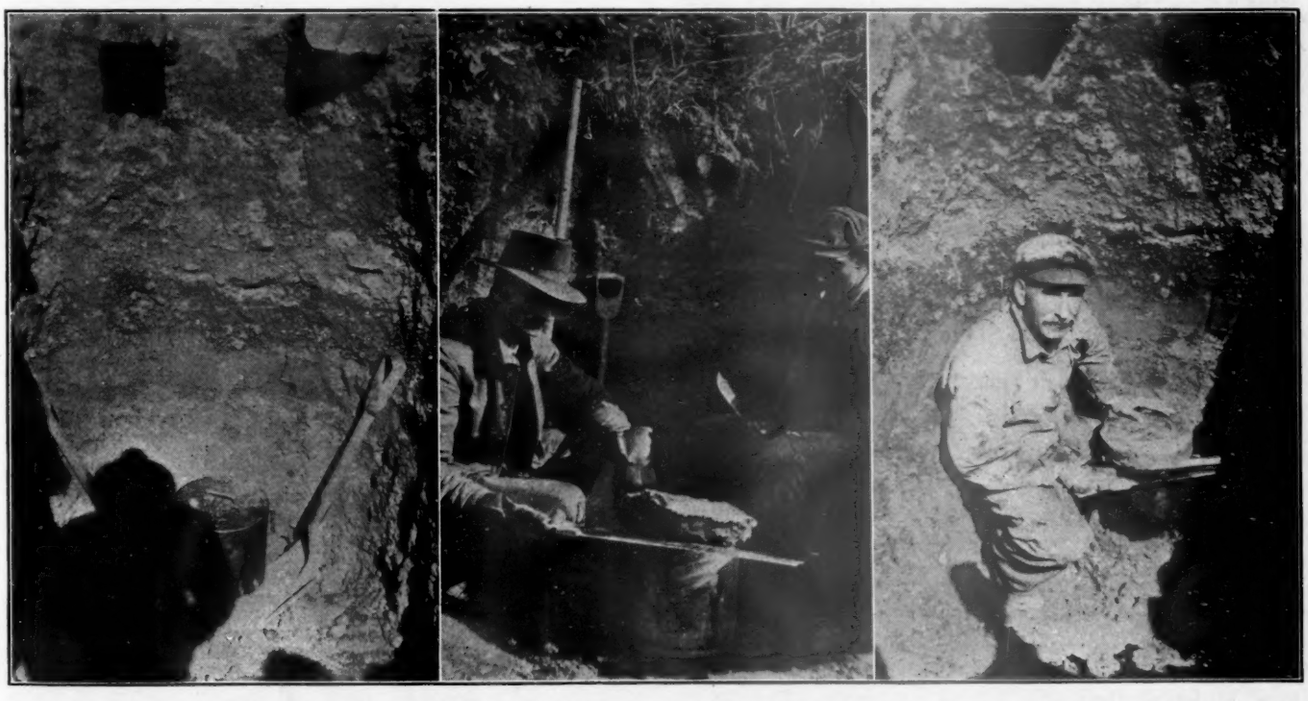
The sample was emptied into a close woven sack—boxed and shipped to the railroad's testing laboratory at Aurora, Ill., where it was broken up into fine aggregates and dried at a temperature of about 170 deg. F., until by successive weighings no further loss in weight was obtained. In all, 89 samples were taken and the critical data relative to these samples are given without segregation or division in Table I.

Analysis of Data

It became apparent early in the course of this experiment that the shrinkage of earth bore some relation to the weight of the earth in its natural bed. Upon this conclusion the shrinkages of the samples were platted in relation to the weight of the metallic content in the natural bed, as shown in Fig. 1. The curve of shrinkage as drawn is merely representative of the center line of the area of the scattered points. It is apparent from the spread of the points that dissimilar materials may have been compared in some cases. The curve, however, as drawn, surely eliminates extreme errors. A similar curve for the complementary or additive factor was developed in the same manner as for shrinkage and is displayed in Fig. 2.

It also became apparent in the course of the experiments that the weight of metallic content in the natural bed bore a relation to the depth below the natural surface. The metallic content weights were platted in relation to the depth below the natural surface and an approximate curve of the relation was drawn as shown in Fig. 3.

Particular attention is drawn to the first series of samples taken—Nos. 1 to 4, inclusive (in the table). Here except for such intermixing of top soil as may have occurred in the movement, the sameness of the material was clearly indicated. The embankment samples were taken in different kinds of embankment—different as to age and use—and the



(Left) Specimen Completely Capped and Shovels Being Inserted Underneath Preparatory to Breaking It Loose and Inverting. (Center) Cylinder Inverted and Earth Protruding from the Bottom Being Sawed Off. (Right) Same Action as Center Picture. Background Shows Irregular Depth of Ballast

results are of particular interest. Sample 1 in comparison with sample 2 returns a shrinkage of 6.7 per cent for a 17-year-old embankment upon which track has never been laid—built for future double tracking; sample 3 in comparison with sample 2 returns a shrinkage of 12.9 per cent for a

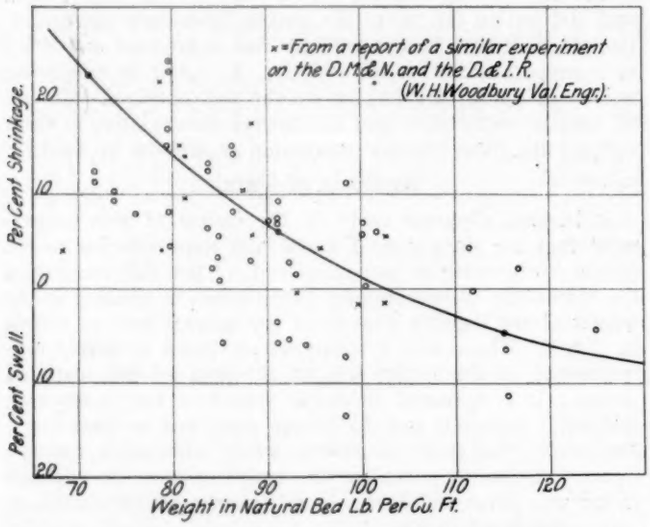


Fig. 2—Curve for the Additive Factor, Volume in Excavation to Volume in Embankment

49-year-old embankment, subjected in its first 32 years of age to the effects of operated traffic—a maximum of 107-ton engines and 30-ton capacity cars—but abandoned for the past 17 years; sample 4 in comparison with sample 2 returns a shrinkage of 13.6 per cent for a 17-year-old embank-

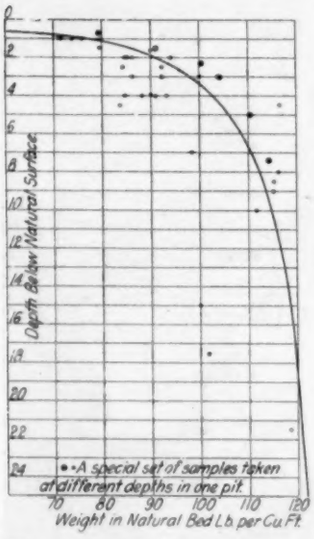


Fig. 3—Relation of Dry Weight to Depth Below Surface

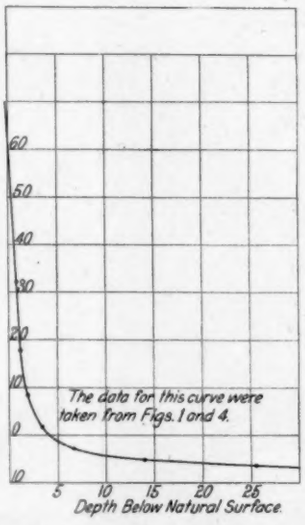


Fig. 4—Relation of Additive Factor Depth of Material in Natural Bed

ment subjected during its life to the traffic effects of the heaviest equipment in the service of the railroad.

Conclusions and Method of Applying the Data

It will be seen from Fig. 1 that the studies so far made, and as herein reported upon, indicate that earth, the metal content of which in its natural bed weighs less than 103 lb. per cu. ft., shrinks when placed in embankment subjected to traffic but when the metal content in the natural bed weighs more than 103 lb. per cu. ft. the material retains a more or less permanent swell.

As shrinkage bears a relation to weight and weight bears a relation to the depth below the surface in the natural bed, shrinkage of embankments can be shown to bear a relation to the depth of the material source in excavation below the natural surface. The same holds true for the complementary or additive factor and a curve of this relation has been developed for this characteristic as shown in Fig. 4.

If a conclusion can be sustained upon the evidence, it can be said that, for the territory considered, earth in embankments taken from the top four feet of the excavation shrinks; and that from lower depths in the excavation it swells. Such a conclusion might seem to mean that the average additive factor applicable to embankments may not be impressive, but upon considering that ordinarily from 60 per cent to 100 per cent of railroad embankments are con-

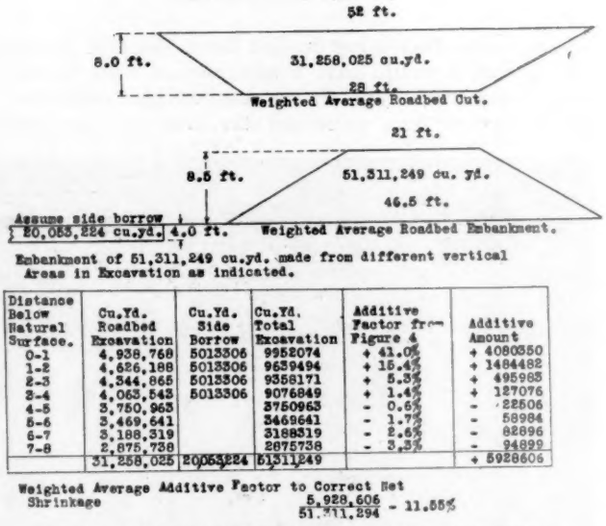
GRADING STATISTICS FOR C.B.& Q.R.R. IOWA LINES

Quantities from unchecked and unaccepted (at this time) I.C.C. Inventory

51,311,249 cu.yd. Roadbed Embankment.
31,258,025 cu.yd. Roadbed Excavation.
20,053,224 cu.yd. Difference - Considered Side Borrow

Miles first main line in Iowa 1407) Average section taken as for
Miles second main line in Iowa 246) single track plus 17.5 per cent
Total length of roadbed cutting 2,637,281 ft.
Total length of roadbed embankment 4,791,679 ft.

Cu. Yd. per ft. of Roadbed Cutting	11.85	sq. ft. area	320.0
Cu. Yd. per ft. of Roadbed Embankment	10.71	sq. ft. area	289.2



Embankment of 51,311,249 cu.yd. made from different vertical Areas in Excavation as indicated.

Distance Below Natural Surface.	Cu.Yd. Roadbed Excavation	Cu.Yd. Side Borrow	Cu.Yd. Total Excavation	Additive Factor from Figure 4	Additive Amount
0-1	4,938,768	5013306	9952074	+ 41.0%	+ 4080350
1-2	4,626,188	5013306	9639494	+ 15.4%	+ 1484482
2-3	4,344,865	5013306	9358171	+ 5.3%	+ 495963
3-4	4,063,543	5013306	9076849	+ 1.4%	+ 127076
4-5	3,750,963		3750963	- 0.6%	- 22506
5-6	3,469,641		3469641	- 1.7%	- 58984
6-7	3,188,319		3188319	- 2.6%	- 82896
7-8	2,875,738		2875738	- 3.3%	- 94899
	31,258,025	20053224	51311249		+ 5928606

Weighted Average Additive Factor to Correct Net Shrinkage $\frac{5,928,606}{51,311,294} = 11.55\%$

Fig. 5—A Practical Application of the Test Data

structed from excavation in the top four feet of earth the average additive figure becomes appreciable. Practically all side borrow falls in this class and the top four feet of roadbed cuttings contains a relatively large yardage on account of the trapezoidal shape of the roadbed section.

As a practical example the grading statistics for Chicago, Burlington & Quincy lines in Iowa are given in Fig. 5. The average additive factor there indicated for net shrinkage for Iowa embankments is shown to be 11.55 per cent.

As it may be held with some reasonableness that the side areas of embankments—involving those quantities lying in the outside three-foot slabs or beyond a slope line drawn from the toe of the ballast—are clear of the influence of loading and are subject to the leavening effects of frost to an extent which neutralizes the shrinkage, such areas may be eliminated from consideration. The net average additive factor of 11.55 per cent derived for Iowa embankments would under this consideration be reduced 20 per cent—the ratio of the area of the side three-foot slabs to the total

average area of embankment. The net average additive factor for Iowa embankments then becomes 9.24 per cent if the deduction of 20 per cent is a proper one.

Gross Shrinkage

The shrinkage above derived, assuming that the curves herewith shown are correct, is the net or inherent shrinkage. The experiment as drawn has no direct reference to the ascertainment of the miscellaneous factors of gross shrinkage. The establishment, however, of the extreme high shrinkage characteristic of surface soil, which is supported by common knowledge of the high porosity and void content of surface soil, indicates an unmeasured subsidence under all embankments. It appears obvious that if surface earth shrinks 40 per cent when used in embankments it will be compressed in natural bed under the superimposed embankment and the effects of traffic. It is easily conceivable that this subsidence in place may amount to at least 0.2 ft. On this assumption and considering the average embankment in the grading of Burlington lines in Iowa the shrinkage in the top soil under embankments would add 3 per cent to the apparent embankment.

The loss by wastage on runways and by wind and rain erosion during construction and prior to acceptance for operation is difficult to estimate. That there is such a loss will be readily agreed to by all engineers experienced in or familiar with railroad construction. Possibly some small percentage based upon opinions of many competent minds should be added. However, allowing only for the general shrinkage of top soil under embankment on a basis of the above given tentative estimate of 3 per cent, the total additive factor for Iowa embankments would be 12.24 per cent

We are indebted for the above information to H. S. Marshall, valuation engineer, and C. E. Oliphant, cost engineer of the Chicago, Burlington & Quincy, Chicago, under whose direction this investigation was conducted.

Employees Demand Minimum Wage of $2,500 a Year

Representatives of Brotherhoods Complete Rebuttal—Carriers to Present Further Testimony on Billion Dollar Requests

THE DECLARATION that $2,500 a year, on an eight-hour basis, for common laborers, with other employees paid a higher rate according to the differentials now established between crafts, would be deemed just and reasonable by railway employees, and a warning that if the award to be made by the Railroad Labor Board did not suit the railway employees the brotherhoods might be forced to acquiesce in the action of the men in leaving railway service for other industries, marked the closing of the employees' rebuttal before the Railroad Labor Board on May 28. B. M. Jewell, acting president of the railroad shopmen's organization, made this demand upon the board and voiced the warning which had already been voiced by representatives of other classes of employees. In addition Mr. Jewell informed the board that the national agreements made during the period of federal control should be considered in the making of any awards. In closing his testimony Mr. Jewell said: "We must have a favorable and quick award applicable to all railway employees. This is absolutely necessary in order to avoid a state of affairs arising wherein we cannot control the situation. Unless a prompt award is made we may find it absolutely necessary, in order to preserve the standard recognized railway labor organizations, to not only refrain from trying to keep men in the service but to acquiesce in the action taken by those who leave the service."

B. F. Grable of the maintenance of way employees' organization also spoke briefly at this session, asking for a speedy adjustment of the wages of maintenance of way employees and the re-establishment of certain differentials. In support of his demands Mr. Grable reiterated that common laborers in outside industries are being paid 20 to 40 cents per hour more than trackmen.

After the rebuttal of the employees had been finished a request was made on the part of the carriers for an opportunity to present further testimony, and the board adjourned until June 1.

At the session of the board on June 1, E. T. Whiter presented the carriers' rebuttal reiterating objections to many of the men's proposals; he again called attention to the discrepancies in their demands and fallacies in the wage plan which the different organizations have requested be established. The first part of the rebuttal dealt with issues common to all of the demands made. The suggestion made by the employees' representatives that statistics presented by the conference committee of managers be checked with figures compiled by the board of railway wages and working conditions and the statistical section, division of operation, Railroad Administration, was concurred in by Mr. Whiter, who in so doing pointed out that all of the carriers' presentation was arranged in a limited time; nevertheless every precaution had been taken to prevent errors and the instances cited to which the men's representatives had objected had been verified as indicative of general objections. All of the exhibits filed with the board were explained by Mr. Whiter.

Regarding the proposal of the trainmen for time and one-half for Sunday and holiday work, Mr. Whiter stated that the rule as proposed was vague and open to construction as a rule providing for payment of time and one-half times time and one-half for this work. W. N. Doak of the Brotherhood of Railway Trainmen denied that the rule was meant to convey this meaning and Mr. Whiter repeated that the rule showed the necessity for the board making clauses in the award clear and applicable to only one construction. Similarly in case of the proposal of the men for the payment of a differential for services on lines having a gradient of one and one-eighth per cent, Mr. Doak asserted that the rule was not meant to apply at such points where grades were encountered as approaches to bridges, coal chutes, etc., and Mr. Whiter called attention to the working of the proposed rule, pointing out that it could be so applied. Subsequently, the carriers' rebuttal dealt with points raised by the representatives of the men in yard service, conductors, firemen, enginemen, telegraphers, signalmen, maintenance of way employees, and members of shop crafts.

Regarding the charge of E. F. Grable of the maintenance of way employees that maintenance of way men were being worked ten hours, not because of the condition of the roads, but to hold men by permitting the earning of increased compensation due to overtime, Mr. Whiter stated that the charge was based on the opinion of one not in position to know the state of the roads and the necessity for the work being done in a short time.

In speaking of shop crafts, Mr. Whiter outlined the car-

riers' position on the national agreement by stating that its restrictive rules were not conductive to economical, efficient operation now that the justification for unification had been taken away by the ending of federal control and the necessity of private corporations to answer for results of operation.

During the hearings it was charged that figures compiled and presented to the board by the carriers were prepared for purpose of ascertaining the costs of operation. The carriers' presentation pointed out that if comparisons were to be made on only basic wage rates the relation of actual cost of the awards and the amounts the men received for work would be but 75 per cent of the total. As to the demand of B. M. Jewell, for the establishment of a basic minimum wage for laborers of $2,500 per year, Mr. Whiter expressed opposition, saying that this figure was larger than the incomes of a vast number of workers.

The hearing before the board on June 2 was opened by the interrogation of Chairman Barton by B. M. Jewell, speaking on behalf of the "associated standard recognized railway labor organizations." Mr. Jewell, after receiving a negative reply to his verbal request for the granting of a temporary award read a prepared statement asking the board to close the hearings on the demands of the men immediately and give consideration to the granting of a temporary award to all railway workers of 18 cents per hour to remain effective until the final awards are made by the board. Mr. Jewell also raised the question as to whether the board under the terms of the transportation act will be able to make its award applicable on all railroads or whether it will apply only to those roads represented by various committees presenting testimony. No decision was rendered by the board on either question during the session.

Mr. Jewell's statement outlined the progress of the wage negotiations during the latter part of federal control, emphasizing promises which have been made to the labor organizations of increases in compensation to meet the rising cost of living. He then read a letter which was filed with the board on May 5 by the committee representing the larger railroad labor organizations and containing a request for an immediate temporary award of 18 cents per hour for all railway workers—this to fulfill promises and enable the men to meet living costs. After citing that the cost of living had risen instead of fallen and that conditions were now even more acute than they were at the time of the filing of the request Mr. Jewell said, "With a full realization of our responsibility and with a desire to do that which will make for the protection of the American public (of which we are a part), as well as securing justice for the railroad employees who have been patient and who have far more than any other been bearing a heavy burden under the most distressing conditions, we now urge the board to close further public hearings and proceed at once in compliance with the rules of the board to reach an agreement and announce an award or decision as per our request in our letter of May 5."

J. G. Luhrsen of the American Train Despatchers' Association was then granted an opportunity to present evidence on behalf of the train despatchers, although Chairman Barton announced that this action should not be taken as a precedent and that nothing would be done by the board to hinder or delay consideration of the demands now before the board. Mr. Luhrsen presented testimony concerning wages, working conditions and responsibility of men in his organization and requested that the trick despatchers be paid $265 and chief despatchers $315 per month as minimum wages. Although there are several points at issue yet which could be made subject to further presentations by both sides it is believed that the hearings will end this week and that the board will go into executive session to consider the awards which may be made. Inasmuch as presentations by both men and carriers have been comprehensive and complete it is argued that decision by the board in the near future will do much to alleviate the unrest now prevalent in labor organizations.

Some Actual Results in Saving Water

THE ILLINOIS CENTRAL has been conducting water-waste campaign for the past five years to impress upon employees and others the value of water and the importance of water-waste prevention. In order to arrive at the saving accomplished as a result of this, a comparison has been made of the conscmption of water at 14 of the largest stations where the supply is taken from the municipal systems, representing 70 per cent of the total consumption and 62 per cent of the total cost of city water, taking 1914 (teh year in which the water-waste campaign was started) as a basis and comparing with the five years ending December 31, 1919.

A statement is submitted herewith showing the decrease in city water consumption during the five-year period, 1915 to 1919 inclusive:

	Gallons	Amount
Chicago	$587,455,000	$36,448.58
Hawthorne, Ill.	7,055,600	705.56
Effingham, Ill.	5,832,200	422.30
Centralia, Ill.	537,663,100	24,194.85
Cairo, Ill.	73,588,440	4,409.66
Mounds, Ill.	139,611,500	3,983.53
E. St. Louis, Ill.	87,015,890	5,038.75
Paducah, Ky.	182,218,400	9,550.88
Louisville, Ky.	209,824,800	9,388.50
Central City, Ky.	9,640,450	497.49
Memphis, Tenn.	388,833,400	38,883.34
Canton, Miss.	51,632,050	2,524.48
Jackson, Miss.	4,637,000	253.24 (Inc.)
New Orleans, La.	5,138,000	359.66 (Inc.)
	$2,270,595,830	$135,435.02

This statement shows that the waste and unnecessary use of city water was decreased 2,270,595,830 gal., an actual reduction on the face of the bills of $135,435.02. During the same period the average increase in tonnage handled amounted to 28 per cent. This would normally increase the consumption of water at least 10 per cent, reflecting a further saving of $131,420.13. During the same period the water pumped by company forces was reduced 5 per cent, which, at 2 cents per thousand gallons, effected a further saving for the five-year period of $60,038.80, a total saving of $326,-893.95 in five years, or an average saving per year of $65,-378.79, nearly $200 per day.

As an example of conditions found in the course of the campaign, the situation at a large terminal can be cited. A request had beeen made for an expenditure of approximately $18,000 for new pumps and pipe lines, and it was stated that the old pumps and pipe lines were too small to furnish sufficient water. A water-waste survey disclosed the fact that approximately 40 per cent of the water being pumped was being wasted. When these conditions were corrected the pumps were found ample to handle the supply without any expenditure for additional equipment.

At a large office building the city-water bill had increased to $440 per month, and as this appeared excessive a water-waste survey was made, with the result that the monthly bill was cut to $116, a decrease of 75 per cent. The cause for waste at this point was a defective control valve on the feed water heater which, operating improperly, allowed city water to pass through the heater to bilge tanks, from which it was pumped into the sewer.

The opportunities for water waste on railroads are many and it is within the power of every employee to save money by practising economy in the use of water, not in the economy that stints, but in the economy of reasonable use. We are indebted for the above information to C. R. Knowles, superintendent of water service of the Illinois Central at Chicago.

The Master Boiler Makers' Convention

Subjects Include Welding of Firebox Sheets and Effect of Steam Pressure on Staybolt Breakage

THE TWELFTH ANNUAL CONVENTION of the Master Boiler Makers' Association opened at the Curtis Hotel, Minneapolis, Minn., at 10:00 a. m., Tuesday, May 25. About 250 members were present at the opening session. The opening address was given by Hon. J. E. Meyers, mayor of Minneapolis, who welcomed the association to the city.

Following this William Schlafge, mechanical manager of the Erie Railroad, spoke of the necessity of organization in the industries, in order that productive efficiency might be increased. The duty of all boiler makers and particularly the foremen, is to hasten the replacement of power equipment in the country by carrying on the good work which has in the past marked their efforts. During the war the principles of conservation of labor and of materials were applied with remarkable results. Machine equipment was adopted wherever possible to aid production, in other words, every effort was made to obtain a maximum result with a minimum expenditure of time and labor. The same principles must be applied to a higher degree now to carry the nation through the present economic crisis without undue hardship. Turning from their constructive duties, Mr. Schlafge spoke of the responsibilities that superintendents and all others in positions of authority have toward the men under them, in instructing them in their work and understanding their requirements. All radical tendencies must be stamped out and the sad experiences of labor in European countries prevented.

The president of the association, John B. Tate, delivered his address on power units of the future. The engineering departments of all roads must provide for more powerful locomotives—engines capable of hauling 150 cars of 150 tons each. In the present freight congestion this need for greater power has been well demonstrated. Stationary boiler design must also be improved so that the operating efficiency may be increased and the cost of upkeep diminished. Because of the increasing tendency toward the electrification of roads, the size and efficiency of power plant units must be increased. During this reconstruction period, the men who hold the responsibilities of supervision in the shops must act at all times in such a manner that decisions are entirely fair and impartial.

The remainder of the Tuesday session was taken up with reports of the secretary and the treasurer and routine business. Under the head of miscellaneous business it was voted to consider the invitation of Section III—Mechanical, American Railroad Association, for the Master Boiler Makers' Association to become a member of the organization.

Wednesday Session

The opening address at the Wednesday session was made by J. M. Hall, assistant chief inspector, Bureau of Locomotive Inspection of the Interstate Commerce Commission, on the causes of boiler failures. Lantern slides of disastrous locomotive explosions were exhibited. The accidents illustrated the more usual contributory causes and in each case these were quite apparent. Low water, corrosion of plates, bad welding of seams, formation of scale in the water glass and gage cock plugs have all increased the total of locomotive disasters. Mention was made of experiments conducted by the chief inspector's office on the relative accuracy of the gage cock and water glass in indicating the true height of water in a boiler. The conclusion reached, after testing various locomotives in different sections of the country, is that a roll of water is raised at the back flue sheet which the gage cock indicates, while the water glass gives the true level of the water as four to eight inches lower, depending on the size and type of the boiler. Within a short time the bureau will issue instructions on the proper installation of gage cocks and water glasses in relation to each other and to the boiler, in order to overcome the danger from former inaccuracies.

W. H. Bremner, president of the Minneapolis & St. Louis, impressed on the members of the association the necessity for the best workmanship and inspection to keep the present equipment of the railroads at 100 per cent efficiency, for although replacements have been commenced it will be many months before any old locomotives will be eliminated. The railroads depend not on any one individual or group to maintain the standards, but upon every man in the organization no matter what his duties may be. The same loyalty must be shown to the private companies now as while the roads were under federal control, for the nation's welfare is absolutely dependent on the service of the railroads, which is being well demonstrated at the present time.

After the conclusion of this talk the remainder of the Wednesday session was devoted to the discussion of papers submitted by members of the association.

Tensile Strength of Firebox Steel

On the question of whether the best results may be obtained from firebox steel having a tensile strength from 48,000 to 58,000 lb. per sq. in., or from 55,000 to 65,000 lb. per sq. in., the committee has endeavored to make the report on the subject as brief as possible. In gathering this information we find there is a very slight difference of opinion, or rather a slight difference in the specifications of the various railroads, for firebox steel.

The members of the committee have given considerable attention to the care of locomotive boilers, including the study of failures of firebox sheets.

In general firebox sheets fail in one of two ways:

(1) Gradual Failure: The sheet may have a good many small cracks which are mostly in a vertical direction. These cracks are thickest, radiating out from the staybolts and frequently run from one staybolt to another in the same vertical row, but never between staybolts horizontally. These cracks are almost always on the fire side and at times extend through the thickness of the sheet, first going through next to the staybolts. Such sheets are almost always accompanied with more or less corrugation and the cracked and corrugated condition is almost always confined to the lower half of the sheet.

(2) Sudden Failure or Rupture: The sheets may fail by a single crack or rupture from a foot to several feet long. In bad cases the crack may extend from the mud ring to the crown sheets, but ordinarily the cracks are confined to the lower half of the sheet, extending upward from the mud ring or from a few inches above it, and it is always near the middle of the side sheet longitudinally. Such sheets may show no corrugations and may show very little if any other defects.

The failures of the first kind are of gradual formation, but those of the second class occur suddenly.

The records on file of one of the largest railroads in the United States show that between the years 1886 and 1913, 115,000 tons of boiler and firebox steel were used on loco-

motive boilers and they do not have any record of any failure that resulted in injury to persons or loss of life due to the character of the material.

This same railroad in 1892 specified and adopted firebox steel with a tensile strength of 55,000 to 65,000 lb. per sq. in., and they are using the same grade today.

It is the opinion of the committee that the life of the firebox sheets does not entirely depend on the specifications or tensile strength of the material, but rather on the care and treatment to which the plates are subject; for instance, the washing of boilers with cold water before the boiler is properly cooled down; second, using the injectors when active steam production is not going on.

In conclusion, from the best information this committee was able to obtain, firebox steel with a tensile strength of 55,000 to 65,000 lb. per sq. in. gives the best results.

However, we would also add that it is our experience that by suitable treatment of water supplies, a proper arrangement for delivering feedwater into the boilers and proper methods of caring for boilers in the enginehouses and elsewhere, long life can be expected with most any grade of firebox steel.

The report is signed by W. J. Murphy, chairman, J. F. Ferestrum and Lewis Eberle.

Discussion

Opinion seemed about equally divided on the desirable tensile strength for firebox steel. Good results have been obtained with steel from 48,000 to 58,000 lb. per square inch, as well as from the higher strength of 55,000 to 65,000 lb. per square inch. It seems to be true that if the staybolts are properly applied along the fire line, crown sheet failures will be prevented. In any case the strength of steel or the carbon content have little to do with failures so long as the material is within the 48,000 to 65,000 lb. per square inch limit.

Effect of Steam Pressures on Staybolt Breakage

On the subject of superheating and reducing steam pressures in locomotive boilers and their effect on staybolt breakage, the committee submitted the following report:

The compiled data taken from six different territories or districts where the service, water condition, etc., differ largely and steam pressure is about the same, are given below:

Data on Staybolt Breakage Covering Period of Five Years

District number	Number of locos.	Steam pressure	Total broken	Bolts broken per year	Bolts broken per engine per year
Superheater	5	185 to 200	127	25.4	5.08
Saturated	5	220	514	102.8	20.56
Superheater	5	185 to 195	216	43.2	8.64
Saturated	5	220	710	142	28.4
Superheater	5	185 to 200	1,193	238.6	47.72
Saturated	5	220	1,848	269.6	73.9
Superheater	5	185 to 200	196	39.2	7.84
Saturated	5	220	1,610	322	64.4
Superheater	5	185	432	86.4	17.28
Saturated	5	220	470	94	18.8
Superheater	1	185 to 200	71		
Saturated	5	220	358	71.6	14.32

All engines involved are Pacific type.

The chart shows there is no doubt that the superheater and reduction of steam pressure of boilers from 220 to 195 lb. pressure will decrease the staybolt breakage.

We have also compared 10 locomotives previously operated as saturated without brick arch. These locomotives were later equipped with a superheater and brick arch, and the pressure remained the same—205 lb.

The comparison shows considerably less staybolt breakage. (While this paper is not on the brick arch, we consider they are co-related and have some bearing on the subject.) The reduced breakage of staybolts is accounted for along these lines: The brick arch acts as an indicator making the proper handling of the boiler compulsory. If the boiler is blown down too soon arch tubes will be distorted. Saving the arch tubes also saves the staybolts.

Our records show that superheating and reducing of steam pressure of boilers result in a reduction of staybolt breakage.

The report is signed by T. L. Mallam, chairman, F. A. Mayer and E. J. Sweeney.

Discussion

An individual report on this subject was submitted by T. L. Mallam, chairman of the report committee.

"The New York Central Railroad in connection with the Pennsylvania, during 1910 made two elaborate series of tests, and the results obtained showed that superheater locomotives decreased the demand on the boiler from 25 to 35 per cent; that is to say, the boilers of the superheater locomotives have to make considerably less steam than the boilers of the other type. This is, of course, due to the fact that less superheated steam, with its greater heat content, is needed for a given power.

"In line with the results of these tests and my own experience, I contend that superheated boilers do not break as many bolts as boilers not superheated. We have in service on our road four O. G. style fireboxes that are not superheated. These four engines carry 200-lb. per square inch pressure, whereas all the others carry 180-lb. pressure. We find that more staybolts are broken in these four engines than in any eight superheaters.

"There is a question in my mind whether the lesser staybolt breakage on our superheaters is the result of the lower boiler pressure or whether it is the result of other conditions caused by superheat, design and service. As just mentioned, I think the superheater boilers do not have to make as much steam as the saturated steam boilers and therefore do not have to be worked as hard as the latter, with the result that firebox sheets are not punished as badly. The lower boiler pressures of a superheater may help, but I am of the opinion that the greater advantage to staybolts and boiler maintenance conditions from superheat is that with it an engine can be more easily fired and the steam maintained more uniformly.

"I believe everyone appreciates the fact that staybolts are caused to break by expansion and contraction, which again causes the inside and outside sheets to move with relation to each other. The harder and more irregularly the boiler is forced, the greater will be such movement and the greater the staybolt strain. The lower the factor of safety in the design, the greater becomes the chance for staybolt breakage with this strain."

The early part of the discussion seemed to indicate that the mere act of decreasing the steam pressure by superheating to obtain the same power as with saturated steam would decrease the breakage of staybolts. However, the problem is not quite as simple, for staybolt breakage depends on a variety of independent factors. The steam must, of course, be considered, but so almost must the type of service, the general topography of the country in which an engine operates, the quality of the water used, and above all the state of repair of the locomotive. To gain even an approximate comparison between superheated locomotives and those utilizing saturated steam, engines of the same type in the same sort of service and the same condition of repair must be used. The nearest approach to such a comparison came from a representative of the Georgia Railroad, in whose charge are eight locomotives fulfilling the above conditions, four of which are superheaters and the other four use saturated steam. From accurate records of the staybolt breakage on these eight machines there does not seem to be a bit of difference. The final conclusion reached is that the design of a locomotive and its service and care have all to do with staybolt breakage.

Cinder Hopper on Bottom of Smoke Arch

From inquiries and observations made, the committee finds that the use of a cinder hopper on the bottom of the smoke

arch is quite varied. There are roads that have some of their engines equipped with a hopper, and others not so equipped, and their performance is also varied; some engines with the hopper as well as those without it clean themselves satisfactorily and steam well, while other engines of the same class and type, having the same design and adjustment of front-end appliance set alike, do not perform as well, accumulating such an amount of cinders in the front end that it is necessary to clean them out while on the road and away from the terminal.

The committee is aware of the fact that with some grades of coal the front end fills up to a greater extent than with other kinds, and to facilitate the removal of cinders the hopper is a convenience, if not a necessity. However, its use or non-use depends largely on local conditions, kind of fuel and grade of coal used. We incline to the opinion that it is not necessary to maintain the hopper on oil burning nor on coal-burning engines that have front-end draft appliances so designed, fitted and adjusted that they will clean themselves without danger of throwing sparks of such size and glow that they cause fires on the road.

Our inquiries further indicate that the foregoing also applies equally as well to the second part of the subject, "On what size locomotives should it be maintained?" and that the use of the cinder hopper is about evenly divided between the larger and smaller classes of engines on the various railroads.

In regard to the third question of the subject, viz., "Which is the better design to overcome air leaks?" we find that there are a number of different designs used by the various roads. Some have hoppers with a double nozzle lengthwise of the smoke arch, others a double nozzle transverse with the arch, the cover held in place by a bolt and spring between the nozzle, while on others a single nozzle with the cover hinged so it will drop down, or one that opens to one side is used. Again, others have the single nozzle hopper, the cover being of wedge shape. As it is of great importance to keep the front end as free as possible from air leaks, it is our opinion that the single nozzle hopper with the cover plate fastened on each side is a better design.

The report is signed by Frank H. Davison, chairman. Thomas J. Reddy and John L. Welk.

DISCUSSION

The need of the cinder hopper on the bottom of the smoke arch has long since been eliminated by most roads. In its place a standard form of non-adjustable, self-cleaning front end has been applied. In some instances a patch is riveted under the smoke arch and a two-inch washout plug arranged to take care of leakage from the pipes or superheater tubes.

Thursday Session

A short talk was given by A. H. Kipp, mechanical superintendent of the Soo Line, on the duties of the members of the association to the country. Following this the discussion of papers was resumed.

Electric and Oxy-Acetylene Welding of Firebox Sheets

In the absence of a report, Prof. A. S. Kinsey, in charge of welding and shop practice at Stevens Institute of Technology, gave a general survey of the present standing of autogenous welding and the future prospects of its recognition as a permissible process of boiler construction.

Professor Kinsey had just been present at the St. Louis meeting of the American Society of Mechanical Engineers, at which a prominent insurance company requested that the Boiler Code Committee, of which Professor Kinsey is a member, allow the use of autogenous welding in stationary heating boilers generating steam up to 15-lb. pressure. The Boiler Code Committee is considering this petition seriously and will probably report favorably on it. In connection with this subject the A. S. M. E. Boiler Code Committee has appointed a sub-committee to investigate the matter of welding seams in boilers and pressure vessels with a similar committee from the American Welding Society.

Forge welding has been allowed a rating of 52 per cent, or a permissable load of 52 per cent of the strength of the metal, by insurance companies. Although autogenous welding is not recognized as yet, there is no reason why fusion welding cannot be made very nearly as strong as forge welding. As a matter of fact, an increase in the rating of forge welding from 52 to 75 per cent is now being considered by the A. S. M. E. If every one interested in advancing the process is united, first of all, in demanding the best welds possible in the shops where the process is used and then in advocating its adoption and recognition by the insurance companies and the A. S. M. E., there can be little doubt of the outcome.

From consultations with A. G. Pack, chief inspector of the Bureau of Locomotive Inspection, and from extensive examinations of defective welds taken from exploded boilers, Professor Kinsey stated that they were some of the worst welds he had ever examined and that they had done a great deal to retard the advance of the process.

The development of autogenous or better fusion welding has nearly reached the point where it is possible to weld manganese steel frogs on rails. Firebox plates can be welded as safely as they can be riveted by either the electric arc or acetylene torch. Any weld may be easily made to lose its strength by burning or oxidizing the metal, and this is the greatest defect to be combated in the operation of welding.

Two rules should be followed in welding. The grain of the metal should be so refined as to come back to its original size and, in the case of steel, the weld should be annealed. When recognized by the A. S. M. E., this requirement for annealing will probably be inserted in the rules for permissible welding procedure.

At the St. Louis meeting of the A. S. M. E. the safe-ending of boiler tubes was discussed at one of the Boiler Code Committee sessions, and the records were consulted to determine if welding were allowable in this case. It was found that it is permissible to weld the safe ends of tubes in fire tube boilers but not in water tubes, which means that locomotives may use it in this connection.

DISCUSSION

The criticisms brought out at the last convention have served their purpose in arousing the interest of all members of the association, and no doubt the fewer accidents from the letting go of welded seams may be due to the closer supervision of all welding in railroad shops. However, if the reports of the Bureau of Locomotive Inspection continue to show any disastrous explosions from the failure of welded seams, it will be a difficult matter to obtain an early official recognition of the process.

A short paper on the procedure used in electric arc welding was given by one of the members.

On the Santa Fe the welding departments of all shops are required to send test specimens of their work to the laboratories to be tested to destruction. The seams are reinforced about 20 per cent and when pulled average about 83 per cent, which is about what is obtained with riveted joints. One instance was cited of 29 specimens taken out of plates after being in service 4½ years, which tested 71 per cent.

As on all other questions, opinion was divided. Certain members advocated great caution in adopting the process, particularly where human life depends on the quality of the work. So long as there is a doubt as to the safety of a seam, and certainly until disasters from weak seams have stopped, it is well to avoid the extensive application of autogenous welding.

The discussion turned from welded seams to the welding

of flues. In certain sections of the country it was found that electrically welded superheater flues cracked, while smaller tubes were not found to do this. In still other districts leaks are found in both superheater and smaller flues. In bad water districts, scale forms in pockets around the flue end, and by preventing the cooling effect of the water, permits the heat to crack the tube. This applies to the side sheet, under the arch as well as where the heat is intense. When staybolts are calked where they enter the side sheets, pin cracks are started if the water does not circulate properly. Flues should be prossered in bad water districts.

Where welds have been found sound in good water districts, a few months with hard water have only been necessary to allow the formation of cracks. The conclusion seemed to be that in good water districts welded flues remained tight, while bad water tended to hasten the formation of cracks in safe ends.

The subject of welding patches was barely touched upon without any definite decision as to their use.

Best Style Grate for Bituminous Coal

No report was submitted by the committee, but a brief outline of the use of the box grate was presented by William Stinsky. In the course of the discussion it was stated that the time is rapidly approaching when the dump grate will be eliminated from both ends of the firebox. The best results have been obtained with box grates having a width of nine inches. If a dump grate is used it must be kept from under the flues, for if used in this position all sorts of leakage and trouble result.

The draft opening in the ashpan was brought up for discussion, and the opinion seemed to be general that at least 15 per cent of the grate area should be opened in the pan to obtain complete combustion of fuel. Even with the opening in the pan, sufficient flues must be installed to carry off the gases. Side openings and center openings have been tried, and netting has been used in the pan, all bringing about good results where used to fill certain operating requirements.

Box grates up to 11 in. wide have been tried and minimum openings of 18 per cent, with varying degrees of success. The standard, however, seems to be a nine-inch grate and a 15 per cent ashpan opening.

Following this the annual election of officers was held.

Officers for 1920-1921

President, Charles P. Patrick, Wilson Welding Repair Company; first vice-president, Thomas Lewis, Lehigh Valley; second vice-president, T. P. Madden, Missouri Pacific; third vice-president, E. W. Young, Chicago, Milwaukee & St. Paul; fourth vice-president, Frank Gray, Chicago & Alton; fifth vice-president, Thomas F. Powers, Chicago & North Western; secretary, Harry D. Vought; treasurer, W. H. Laugbridge, Hocking Valley.

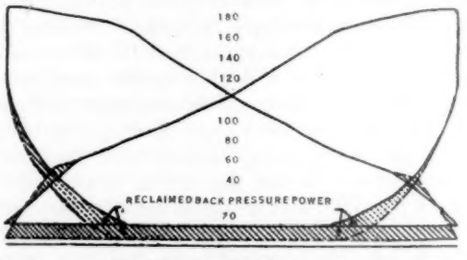
Executive board for one year: L. M. Stewart, Atlantic Coast Line; John F. Raps, Illinois Central; John Harthill, New York Central. For two years: W. J. Murphy, Pennsylvania Railroad; Harry F. Weldin, Pennsylvania Railroad; E. J. Reardon, Interstate Commerce Commission. Three years: B. F. Sarver, Pennsylvania Lines; George Austin, Santa Fe; H. J. Wandberg, Chicago, Milwaukee & St. Paul.

TWELVE MEN, INCLUDING TWO MERCHANTS, were arrested in New York and Jersey City on May 28, charged with theft of 600 bolts of woolen serge which had been stolen from a freight car on the Erie Railroad on the night of May 24. The car was moved surreptitiously in the night from a freight yard in Jersey City about nine miles westward. The cloth appears to have been carried away in automobile trucks and was recovered, some days later, in a garage in New York City.

The Lewis Draft Appliance

A LOCOMOTIVE front-end draft appliance, which produces a non-pulsating, uniformly distributed draft on the fire and automatically maintains a constant, low cylinder back pressure, has been placed on the market by the Lewis Draft Appliance Company, Chicago. This front-end arrangement departs radically from the form of apparatus generally in use, the departure being made to conform to well-established laws relating to the flow of gases.

The device consists essentially of a rectangular nozzle with automatically adjustable vanes to control the size of the outlet, a volume chamber which is inserted in the line of the exhaust passages between the valve chambers and the nozzle, and a stack of oval cross section, the long axis of which is transverse to the center line of the engine. The nozzle vanes, as shown in the drawing, are supported on shafts, the operating ends of which extend outside of the smoke box, where they are geared together. Automatic adjustment of these vanes is obtained by means of dead weights, which are hung from the end of an arm attached to one of the shafts. These weights, once adjusted to maintain a given back pressure, require no further adjustment so long as the conditions of combustion remain unchanged. At the lower end of the case containing the weights is placed a small oil dash pot, the purpose of which is to steady the vanes and prevent chattering, especially



Increased Area of Indicator Card Due to Decreased Back Pressure

when the locomotive is operating at slow speeds and exhaust pulsations are in evidence at the nozzle.

It will be noticed that the stack is arranged in a form roughly corresponding to a two-stage ejector. The inner stack is made wide enough at the bottom to take in the full width of the exhaust jet, which completely fills the main stack at a point just above the top of the inner stack. The space between the inner and the main stacks carries gases only, the motion here being produced not by the entraining action of the jet, but by the vacuum induced by the jet where it fills the main stack.

The form of the exhaust jet is based on two principles; one is that gases tend to take the shortest path in traveling between two points, and the other is that entraining action depends on the periphery of the jet rather than on its sectional area. Where the circular nozzle and stack are used, the tendency is to create a strong pull through the flues near the vertical center line of the tube sheet, thus requiring the usual form of diaphragm in the front end to effect something approaching a uniform distribution of the draft over the grate. With the exhaust jet in the form produced by the Lewis device uniform lateral distribution is provided without the use of the diaphragm, and the resistance to the flow of the gases is thereby considerably reduced.

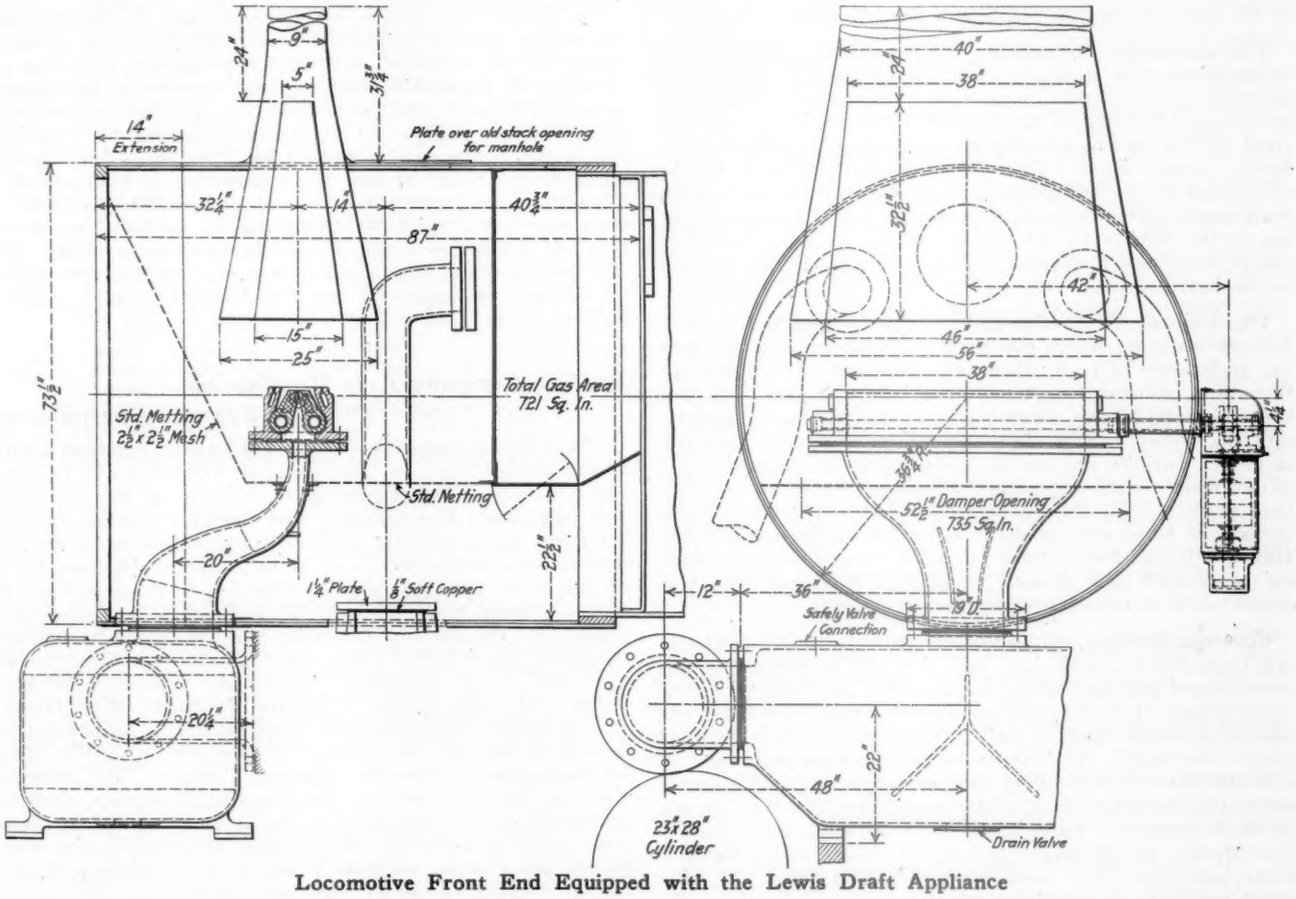
A material improvement in draft conditions is also effected by the volume chamber. This is of sufficient size so that the pulsations of the exhaust practically disappear at speeds above eight miles an hour and at lower speeds, although the pulsations are distinctly noticeable, the sharp, tearing action on the fire is said to be absent.

The drawings show the device as it has been worked out

for application to a superheated locomotive, and a diaphragm and damper have been retained over the superheater flues. Originally it was applied to a saturated locomotive and no diaphragm was used. This engine was of the Mikado type, having 24-in. by 30-in. cylinders and weighing 200,000 lb. on the drivers. On this engine the maximum area of the nozzle opening was equivalent to a 10-in. circular opening and the weighted vanes were adjusted to maintain approximately a back pressure of four pounds per square inch. The effect on the power of the engine is shown on the indicator card. The freedom from back pressure made it possible to change the valve setting so that the exhaust was delayed 3½ per cent longer than formerly, which, together with the decreased back pressure, materially increased the work obtained from a given weight of steam.

While no coal tests have been made, observations of this locomotive in service have indicated that such an increase in work is actually obtained and that the general performance of the locomotive has been improved. The engine is reported to have handled from 10 to 20 per cent in excess of its regular tonnage. The back pressure did not exceed 4 lb. and the maximum draft was not above 2½ in. of water in the front end. This draft has been sufficient to maintain steam pressure both on grades and on level portions of the line.

The variable nozzle, which is normally closed, opens with a minimum of one-pound pressure in the expansion chamber and closes when the engine is drifting; this prevents hot gases from the front end entering the cylinders. When the engine is starting or working at slow speeds and long cut-off, the action of the volume chamber and the wide opening of the nozzle prevents the so-called back lash of the suddenly discharged large volume of exhaust from one cylinder against the piston of the other, thus increasing the power of the locomotive at the critical points when starting a heavy train.



Locomotive Front End Equipped with the Lewis Draft Appliance

Certificates of Public Convenience and Necessity

THE INTERSTATE COMMERCE COMMISSION has issued an interpretation of paragraph 18 of section 1 of the interstate commerce act, as amended by the transportation act, 1920, holding that if a projected extension or construction is actually undertaken in good faith on or before 90 days after the approval of the transportation act, by a carrier, subject to the interstate commerce act, which will operate the line, certificate will not be required of such carrier, either for extension or construction or for acquirement, operation or engaging in transportation under the act; but the undertaking must embrace not merely purpose or intent to extend or construct, but also the actual doing in good faith of acts calculated to completely effect such purpose.

All carriers contemplating or engaged in such work should immediately notify the commission of all the facts and circumstances connected therewith, in order that the commission may determine whether or not the work has been actually undertaken as contemplated by the act and whether or not a certificate of convenience and necessity will be required.

The commission further holds that the mere provision in a charter or prospectus, or the making of a preliminary survey for the extension or construction of a line of railroad, does not constitute an undertaking of such extension or construction, and that where a line of railroad has been constructed by a carrier, corporation or other person, not subject to the act, a certificate of convenience and necessity will be required before the line may be acquired or operated by a carrier subject to the act and before any carrier may engage in transportation under the act over or by means of such additional or extended line of railroad.

General News Department

A memorial tablet, set up in the Railroad Young Men's Christian Association in St. Louis, in honor of the railroad men who died during the war, was unveiled by the St. Louis Railway Club on May 28.

Indictments on charges of conspiring to obstruct interstate commerce were found by the Grand Jury in the United States Court at Pittsburgh, Pa., on the 26th day of May, against five former railroad employees of New Castle, Pa. These men are accused of using threats and foul and abusive language, on May 4, to induce seven other men to refuse to move trains. Similar indictments were found at Newark, N. J., on the 26th against ten men said to have been leaders in the railroad yard strikes in and near Newark.

The anti-strike bill introduced by Senator Poindexter of Washington, was favorably reported to the Senate on May 29 from the committee on interstate commerce. The report by Senator Poindexter declared that "There is no inherent right in any citizen to obstruct or destroy interstate commerce transportation. Organized labor's declaration to the effect that the bill would impose involuntary servitude upon the railway workmen, is entirely unfounded. "There is nothing in the bill," says the report, "which by any possibility can be construed to compel a man to remain against his will in the railroad service."

The Railway Brotherhoods strongly oppose a Board of Arbitration upon which the public is represented; this was the declaration of L. E. Sheppard, president of the Order of Railway Conductors in an address before members of the City Club of Chicago on May 27. In concluding his talk he said that labor should always settle its problems with the employer directly and not by means of an arbitration committee which could not understand the problems of the railroad workers. Mr. Sheppard also said that a general strike of railroad employees need not be feared by the public; that although it has been found advisable to call small strikes, the conservative labor leaders do not favor a general strike and do not intend to interfere with passenger service.

Governor Harding, of the Federal Reserve Board, responding to a Senate resolution, said that the resources of the member and non-member banks would be ample to take care of the essential business of the country, and, to a large extent, of non-essentials as well, if there were a freer flow of goods and credit. If "frozen loans" were liquefied and if commodities which are held back either for speculative purposes or because of lack of transportation facilities should go to the markets, and if large stocks of merchandise should be reduced, the resultant release of credit would have a most beneficial effect upon the general situation. If adequate railroad and steamship transportation facilities can be provided, "the board sees no occasion for apprehension in connection with the movement of crops now being grown."

The New England Weighing & Inspection Bureau has been established at Boston to take over the work, as it relates to the principal New England railroads of the Eastern Freight Inspection Bureau. The new bureau will attend to the correction of errors in classification and weighing; to packing and marking, where attention is required, and to matters connected with storage of freight. The manager of the bureau is F. E. Dewey (with office at South Station), who is also District Manager of the A. R. A. Commission on Car Service. The announcement of the bureau, signed by the Boston & Maine, the Boston & Albany, the Bangor & Aroostook, the Central Vermont, the Maine Central, the New York, New Haven & Hartford and the Rutland, states that matters in connection with freight car demurrage, milling, etc., will be handled by each railroad for itself.

Railway Claim Agents

The Association of Railway Claim Agents held its annual meeting at Atlantic City on May 19, 20 and 21. A. H. Mansfield, claims attorney of the Missouri Pacific, was elected president for the ensuing year; D. H. Kimball (G. N.), John B. Green (C. J.), and Peter K. Soffel (W. & L. E.) were elected vice-presidents; and W. H. Failing (C. R. R. of N. J.), Jersey City, N. J., was re-elected secretary and treasurer.

The meeting voted to meet next year at St. Louis, Mo.

Plumb Plan League

The Plumb Plan League, which has claimed to represent the two million railroad employees, has a membership of approximately 200,000 individuals and 4,000 organizations, according to testimony by Edward Keating, business manager of the league, before the Senate committee investigating campaign expenditures, at Washington on June 2. Mr. Keating said that the organization is not backing any candidate for President. The league's publication, "Labor," he said, has a circulation of approximately 250,000 and the league's income is about $240,000 or $250,000 a year, representing the $1.00 membership fee for individual members and a $10 membership fee for organization members. He said that out of the surplus above the cost of producing the paper six fieldmen are supported and that Glenn E. Plumb receives $1,000 a month.

Reading Company Asks Modification of Supreme Court Decree

The Reading Company on June 1 asked the Supreme Court of the United States to reconsider its recent decree holding the company to be operating in violation of the Sherman anti-trust law. The company said the decree would impose a burden and a possible loss on it and asked especially for modification of the decree, so as to permit the holding by it of the stock of either the Philadelphia & Reading Coal & Iron Company or the Philadelphia & Reading Company, providing that the Reading Company had disenabled itself from exercising any influence upon the conduct of the business of the other of the companies and of the Lehigh & Wilkes-Barre Coal Company and the Central Railroad of New Jersey. It was further asked that the district court be authorized to determine whether the Central of New Jersey after it shall be disassociated from the Reading Company, the Reading Railway Company and the Reading Coal Company, shall be permitted to hold the stock of the Wilkes-Barre Coal Company upon terms which shall impose upon these two companies the conduct of their business in harmony with the law as interpreted by the Supreme Court.

Salaries of Railroad Officers in 1917

A list of the salaries paid to railroad officers in 1917, naming each one who received $5,000 or over, as compiled by the Railroad Wage Commission appointed by Director General McAdoo in 1918, in connection with its investigation of the wage demands of the railroad employees, was published in the Congressional Record for June 1 by Representative Thetus W. Sims of Tennessee. The list was furnished to the congressman for such publication by Interstate Commerce Commissioner C. C. McChord (who was a member of the wage commission) last October. This was in response to a request by Mr. Sims at the time when the legislative committee of the Interstate Commerce Commission was before the House committee on interstate and foreign commerce. A list of 208 railway officers receiving salaries of $20,000 and over for 1917, as previously published in the Con-

gressional Record by Mr. Sims, was reprinted in the *Railway Age* of October 10, 1919 (page 751). This was taken from the complete list now made public. The full list contains approximately 3,000 names, of which about 800 are shown as having received less than $6,000 a year and about 1,800 less than $10,000 a year.

"Better Cause a Delay Than Cause an Accident."

This "slogan" of the Chicago & North Western makes its latest appearance in Safety Bulletin No. 54, recently issued by Chairman R. C. Richards, addressed to "All North Western Men," in which attention is drawn to the fact that in 1919 the number of employees killed per thousand employed was 1.49, as compared with a rate in 1910 of 2.10 per thousand, a reduction of 29 per cent.

Below is a fac-simile of the body of the Bulletin, reduced about one-half in width and height.

SAFETY FIRST, which stands for—

Conservation of Human life and Safety Men as well as Things,

in nine and one-half years on the North Western has brought about the reduction in accidents to employes shown in the following statement:

	KILLED	INJURED
1910 (Before the Safety Organization was started)	97	8404
1911	76	6025
1912	73	6043
1913	67	6395
1914	49	5520
1915	34	5221
1916	60	6939
1917	85	7955
1918	79	6920
1919	78	5709

Mileage,	1910 - - 7,953;	1920 - -	8,423
Number of Employes,	1910 - - 46,559;	1919 - -	52,243
Operating Revenues,	1910 $75,590,300;	1919	$139,589,915

Why not boost for SAFETY FIRST and help wipe out the accident business?

R. C. Richards

Chairman, Central Safety Committee

The Central Safety Committee of the North Western, in Bulletin No. 53, shows that as compared with 9½ years prior to June 30, 1910, the records of the 9½ years ending December 31, 1919, exhibit a decrease of 36.3 per cent in the number of employees killed and 25.6 per cent in employees injured; 7.8 per cent reduction in passengers killed, and 20.8 per cent in passengers injured; 22.8 per cent in "other persons" killed, and 5.4 per cent in "others" injured.

A. S. C. E. Rebukes Engineering Council

As a further step in the Pittsburgh bridge tangle, the board of directors of the American Society of Civil Engineers has taken exception to the resolution adopted jointly by Engineering Council and the American Institute of Architects on May 4 at Washington, D. C., and has disclaimed any concurrence with it. This joint resolution in brief stated that under certain conditions a structure should be aesthetically excellent in addition to such features as safety, adequacy and durability, etc. In such cases the design would involve collaboration between engineers and architects and therefore the fact of whether the engineer was chief and the architect associate or vice versa was an administrative detail of relative unimportance. This was brought about by resolutions adopted previously by the American Society of Civil Engineers and the American Institute of Consulting Engineers, wherein they stated that the responsibility for the design and construction of structures wherein public safety was concerned should be entrusted only to qualified civil engineers. In other words, Engineering Council did not agree with the above statements of the A. S. C. E. and the A. I. C. E.

The resolution adopted by the board of directors and presented before the June 2 meeting of the society states that the board reaffirms its attitude as expressed in its previous resolution and that "the matter of bridge design as established by practice is one solely within the province of civil engineers and is therefore not a matter upon which Engineering Council has been delegated authority of action." It was further resolved "that Engineering Council be requested to refrain from any attempt to represent this society in a discussion of this matter."

Meetings and Conventions

The following list gives names of secretaries, dates of next or regular meetings and places of meetings:

AIR BRAKE ASSOCIATION.—F. M. Nellis, Room 3014, 163 Broadway, New New York City.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—F. A. Pontious, Supervisor of Demurrage and Storage, C. & N. W. Ry., Chicago.

AMERICAN ASSOCIATION OF DINING CAR SUPERINTENDENTS.—S. W. Derr, C. R. R. of N. J., Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, Illinois Central, Chicago. Next annual meeting, June 15, 1920, Minneapolis, Minn.

AMERICAN ASSOCIATION OF GENERAL BAGGAGE AGENTS.—E. L. Duncan, C. & E. I. R. R., 332 South Michigan Ave., Chicago.

AMERICAN ASSOCIATION OF PASSENGER TRAFFIC OFFICERS.—W. C. Hope, C. R. R. of N. J., 143 Liberty St., New York.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—J. Rothschild, Union Station, St. Louis, Mo.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 8 W. 40th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOCIATION.—C. F. J. Dell, 50 E. 42nd St., New York.

AMERICAN RAILROAD MASTER TINNERS', COPPERSMITHS' AND PIPE FITTERS' ASSOCIATION.—Otto E. Schlinck, 185 W. 5th St., Peru, Ind.

AMERICAN RAILROAD ASSOCIATION.—J. E. Fairbanks, 75 Chuch St., New York:

Section I, Operating (including former activities of Association of Railway Telegraph Superintendents).—W. J. Fripp (chairman), N. Y. C. R. R., New York, N. Y.

Telegraph and Telephone Division.—J. F. Caskey (chairman), Supt. of Telegraph, Lehigh Valley.

Section II, Engineering.—E. H. Fritch, 431 South Dearborn St., Chicago.

Signal Division.—H. S. Balliet, 75 Church St., New York. Annual meeting, June 14-16, Alexandria Bay, N. Y.

Section III, Mechanical (including former activities of Master Car Builders' and Master Mechanics' Association).—V. R. Hawthorne, 431 South Dearborn St., Chicago. Next convention, June 9-16, 1920, Atlantic City, N. J.

Section IV, Traffic.—Robert C. Wright (chairman), General Traffic manager, P. R. R., Philadelphia, Pa.

Section V, Transportation (including former activities of Association of Transportation and Car Accounting Officials.—E. J. Pearson (chairman), President, N. Y., N. H. & H. R. R., New Haven, Conn.

Section VI, Purchases and Stores (including former activities of Railway Storekeepers' Association).—J. P. Murphy, N. Y. C. R. R., Collinwood, Ohio. First annual meeting, June 14-16, 1920, Atlantic City, N. J.

Section VII, Freight Claims (including former activities of the Freight Claim Association).—Lewis Pilcher, 431 South Dearborn St., Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W. Ry., 319 N. Waller Ave., Austin Station, Chicago. Next convention, October 26-28, 1920, Atlanta, Ga.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—(Works in co-operation with the American Railroad Association, Section II.) E. H. Fritch, 431 South Dearborn St., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—(See American Railroad Association, Section III, Mechanical.)

AMERICAN RAILWAY PERISHABLE FREIGHT ASSOCIATION.—E. F. McPike, 135 E. 11th Place, Chicago. Regular meetings, 2nd Wednesday in March and September.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—R. D. Fletcher, 1145 East Marquette Road, Chicago.

AMERICAN SHORT LINE RAILROAD ASSOCIATION.—T. F. Whittelsey, Union Trust Bldg., Washington, D. C.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, University of Pennsylvania, Philadelphia, Pa. Next annual meeting, June 22-25, 1920. New Monterey Hotel, Asbury Park, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Col H. S. Cracker (acting secretary), Engineering Societies Building, 33 W. 39th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 33 W. 39th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN STEEL TREATERS' SOCIETY.—W. H. Eisenman, 154 East Erie St., Chicago.

AMERICAN TRAIN DESPATCHERS' ASSOCIATION.—D. L. Darling, Northern Pacific Ry., Spokane, Wash.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Mt. Royal Sta., Baltimore, Md. Next annual meeting, January 25-27, 1921, San Francisco.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—Willis H. Failing, C. R. R. of N. J., Jersey City, N. J.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W., Room 411, C. & N. W. Sta., Chicago. Semi-annual meeting, June 14, Hotel Dennis, Atlantic City.

ASSOCIATION OF RAILWAY EXECUTIVES.—Thomas De Witt Cuyler (chairman), 61 Broadway, New York, N. Y.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—(See American Railroad Association, Section 1, Operating.)

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—(See American Railroad Association, Section V. Transportation.)

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—G. R. McVay, Barrett Company, Chicago.

CANADIAN RAILWAY CLUB.—W. A. Booth, 131 Charron St., Montreal, Que.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 626 North Pine Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, New Morrison Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—Thomas B. Koeneke, Federal Reserve Bank Bldg., St. Louis, Mo. Meetings first Tuesday in month at the American Hotel Annex, St. Louis.

CENTRAL RAILWAY CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 2d Thursday in November and 2d Friday in January, March, May and September, Hotel Statler, Buffalo, N. Y.

CHIEF INTERCHANGE CAR INSPECTORS' AND CAR FOREMEN'S ASSOCIATION.—J. C. Keene, General Car Inspector, Wabash R. R., Decatur, Ill.

CHIEF INTERCHANGE CAR INSPECTORS' AND CAR FOREMEN'S SUPPLY MEN'S ASSOCIATION.—D. B. Wright, Lehon Company, 45th and Oakley Sts., Chicago.

CINCINNATI RAILWAY CLUB.—H. Boutet, 101 Carew Bldg., Cincinnati, Ohio.

EASTERN RAILROAD ASSOCIATION.—D. G. Stuart, Washington, D. C.

FREIGHT CLAIM ASSOCIATION.—(See American Railroad Association, Section VIII, Freight Claims.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Sta., Chicago. Regular meetings, Wednesday preceding 3d Friday in month, Room 856, Insurance Exchange Bldg., Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, B. & O., Lima, Ohio.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—J. G. Crawford, 702 E. 51st St., Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 1061 W. Wabash Ave., Winona, Minn. Next convention, September 7-10, Hotel Sherman, Chicago.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION.—E. E. Martin, Union Pacific R. R., Room No. 19, Union Pacific Bldg., Kansas City, Mo. Next convention, October 5-7, 1920, Detroit, Mich.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.

MASTER CAR BUILDERS' ASSOCIATION.—(See American Railroad Association, Section III, Mechanical.)

NATIONAL ASSOCIATION OF RAILROAD TIE PRODUCERS.—J. J. Schafly, Potosi Tie & Lumber Company, St. Louis, Mo.

NATIONAL ASSOCIATION OF RAILWAY AND UTILITIES COMMISSIONERS.—James B. Walker, 49 Lafayette St., New York. Next convention, November 9, 1920, Washington, D. C.

NATIONAL FOREIGN TRADE COUNCIL.—O. K. Davis, 1 Hanover Square, New York.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, Kelly-Derby Co., Peoples Gas Bldg., Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, excepting months of June, July, August and September.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

PACIFIC RAILWAY CLUB.—W. S. Wollner, 64 Pine St., San Francisco, Cal. Regular meeting 2d Thursday in month, alternately in San Francisco and Oakland.

RAILWAY ACCOUNTING OFFICERS' ASSOCIATION.—E. R. Woodson, 1116 Woodward Bldg., Washington, D. C.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa. Regular meetings, 4th Thursday in month, except June, July and August, Americus Club House, Pittsburgh, Pa.

RAILWAY DEVELOPMENT ASSOCIATION.—D. C. Welty, Missouri Pacific R. R., Little Rock, Ark.

RAILWAY ELECTRIC SUPPLY MANUFACTURERS' ASSOCIATION.—J. Scribner, General Electric Co., Chicago. Annual meeting with Association of Railway Electrical Engineers.

RAILWAY EQUIPMENT MANUFACTURERS' ASSOCIATION.—D. L. Eubank, Galena Signal Oil Company, Richmond, Va.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio R. R., Baltimore, Md.

RAILWAY REAL ESTATE ASSOCIATION.—R. H. Morrison, C. & O. Ry., Richmond, Va.

RAILWAY SIGNAL ASSOCIATION.—(See American Railroad Association, Section II. Signal Division.)

RAILWAY STOREKEEPERS' ASSOCIATION.—(See American Railroad Association, Section VI, Purchases and Stores.)

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver Bldg., Pittsburgh, Pa. Next convention, June 9-16, Atlantic City.

RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASSOCIATION.—G. A. Nelson, Waterbury Battery Co., 30 Church St., New York.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—P. J. McAndrews, C. & N. W. Ry., Sterling, Ill.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmunds, West Nyack, Rockland County, New York.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—L. W. Cox, 1217 Commercial Trust Bldg., Philadelphia, Pa.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, P. O. Box 1205, Atlanta, Ga. Regular meetings, 3d Thursday in January, March, May, July, September and November, Piedmont Hotel, Atlanta.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, Western Ry. of Ala., Atlanta, Ga.

SUPPLY ASSOCIATION OF AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—C. N. Thulin, Duff Manufacturing Company, 935 Peoples Gas Bldg., Chicago.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. R. R., Cleveland, O. Next convention, September 14-17, Hotel Sherman, Chicago.

WESTERN ASSOCIATION OF SHORT LINE RAILROADS.—Clarence M. Oddie, Mills Bldg., San Francisco.

WESTERN RAILWAY CLUB.—J. M. Byrne, 916 W. 78th St., Chicago. Regular meetings, 3d Monday in month, except June, July and August.

Traffic News

The Southern Pacific Company has resumed its steamship service between New York and New Orleans with the sailing of the steamship Comus.

The Interstate Commerce Commission has authorized the Denver & Rio Grande to make reduced commodity rates on buffalo, in carloads, between all stations on its lines.

Joseph H. Beek, traffic director of the St. Paul Association, St. Paul, Minn., has been appointed executive secretary of the National Industrial Traffic League, with headquarters at Chicago, succeeding Guy M. Freer, deceased.

The Pennsylvania Station, Seventh avenue, New York City, now has six main entrances, an underground passage connecting with Broadway having just been opened. The station fronts on Seventh avenue, Thirty-third street, Eighth avenue and Thirty-first street. Midway between Seventh and Eighth avenues there is a passage from Thirty-fourth street leading to the station level (beneath Thirty-third street), and the new passage to Broadway (and Sixth avenue), is beneath the south sidewalk of Thirty-fourth street. It has entrances to Hotel Pennsylvania and Gimbel Brothers' department store. This passage is 740 feet long, and it connects the station with two city railroads, the Sixth avenue elevated and the Broadway subway.

The Senate on May 29 adopted a resolution, introduced by Senator Harding of Ohio, calling upon the Interstate Commerce Commission to inform the Senate upon what authority, if any, it issued its order of April 15, authorizing the railroads to designate private cars and cars placed for railroad fuel loading in accordance with the decisions of the commission in previous cases as "assigned cars" for railroad fuel. The resolution states that the railroad companies, or a part of them, are making such assignments in a manner alleged to be discriminatory and prejudicial to the public welfare, and Senator Harding, in introducing the resolution, took the position that the order was a suspension of a clearly expressed provision of the transportation act, which requires, in case of shortage, a just and equitable disposition of cars among coal mines.

Coal Production

A slight recovery during the week ended May 22 carried bituminous coal production upwards to almost exactly the level of two weeks before, according to the weekly bulletin of the United States Geological Survey. The total output of soft coal, including lignite and coal coked, is estimated at 9,174,000 tons, an increase over the preceding week of 418,000 tons, or 4.8 per cent. In spite of the improvement the rate of production is still 13 per cent below that of the first quarter of 1920, and 27 per cent below that of October, 1919. Continued for a year, the present rate of 1,529,000 tons per working day would give a total production of 470,000,000 tons. Progress in relieving the traffic congestion caused by the switchmen's strike is thus slow, the bulletin says. The week was the seventh of the strike period, but the total production was 1,841,000 tons less than that of the latest normal week, March 14-20.

The year 1920, although 35,000,000 tons ahead of 1919, is now nearly 12,000,000 tons behind 1917 and 16,000,000 behind 1918.

The reports for the week of May 15 show the car shortage which has accompanied the switchmen's strike in a stage of heightened intensity, according to the bulletin. Losses of working time due to transportation disability grew more severe. The zone of dull market west of the Mississippi moved north, but over the country as a whole the no-market loss was insignificant. The dominant factor limiting production remained transportation. The week witnessed an aggravation of the unprecedented shortage of cars which has prevailed since April 10. Losses of working time attributed to "car shortage" increased from 44.9 during the preceding week to 46.6 per cent, or 22.4 hours out of the 48. The present transportation equipment is

the same which in October, 1919, when coal was given priority over other freight, moved over 2,000,000 tons of bituminous coal a day with a car shortage loss of less than 12 per cent.

The Freight Situation at New York

The freight situation at New York shows marked improvement, according to a statement issued on June 2 by B. C. Craig, chairman of the New York joint terminal committee, but it will be many weeks before normal conditions return. The effects of the "outlaw" strike are still felt. The only New York roads that have a normal yard service are the Erie and the Lackawanna. The New York Central is 98 per cent normal, the Pennsylvania 85 per cent, the Baltimore & Ohio 90 per cent, the Lehigh Valley 85 per cent, and the Central of New Jersey 85 per cent.

Embargoes still apply to all non-essential shipments. The movement of perishable food is satisfactory and manufacturers are getting enough coal for their temporary needs. The greatest source of trouble, now, as for the past four weeks, is the marine service, which is only about 65 per cent. in operation. This is seriously crippling the export trade. Building materials and raw material for manufacturers are held up except in exceptional cases. Delay in calling for freight is a serious cause of congestion, and embargoes against consignees who delay unduly in getting freight may be imposed. Hay dealers are among the worst offenders, sixty-nine carloads being delayed by one dealer alone.

More than 1,400 cars of freight were received on Sunday and Monday, but the consignees, for the most part, did not send for it because of the extra holiday pay for truckmen. The railroads kept all of their men at work and unloaded the l. c. l. freight.

The Freight Situation in the West

General improvement in the transportation situation continues to be reported from the middle west, west and southwest. The larger terminals show a loosening of the car tie-up, due largely to the summary action taken by the Interstate Commerce Commission in ordering the movement of box cars west and coal cars east. A number of railroads which transport freight to Gulf and south Atlantic ports sent telegrams to shippers urging them to avoid the congestion at eastern ports and send their freight south. Industries in Detroit and other lake ports have sent considerable quantities of their products to Chicago by water.

The coal shortage in the Chicago district is expected to be considerably relieved through the application of an order issued by the Interstate Commerce Commission on May 26, directing four railroads, the Minneapolis & St. Louis, the Chicago, Rock Island & Pacific, the Chicago & North Western and the Chicago, Milwaukee & St. Paul, not operating in the coal fields, to return 1,300 open top cars daily, for 20 days, to five roads, the Illinois Central, the Chicago, Burlington & Quincy, the Chicago & Eastern Illinois, the Chicago, Indianapolis & Louisville and the Pennsylvania Lines, which serve the Illinois bituminous district. Mines in this territory will thus be enabled to increase their operating time, which is now only about 35 per cent. Several railroads serving the coal producing fields in Illinois have practically stopped storing coal for their own use, as their supplies are now up to normal. While the situation in Chicago is still bad, deliveries in the district have increased in the last week. Reports from the steel industries in the Pittsburgh district, which have been badly crippled through the shortage of coal and coke, show considerable improvement.

Labor conditions in a number of the larger terminals are considerably improved. The latest figures relative to the "outlaw" strike show that, in the Chicago district, a total of 4,479 switchmen, exclusive of officers and clerks, are at work, out of a normal 6,200. Comparative figures of the total number of cars handled by the Indiana Harbor Belt during the last 10 days of May, 1919, and 1920, show an increase in 1920 of 2,877 cars.

The demand for freight cars of every kind continues to be heavy, particularly refrigerator cars, in the west. Miscellaneous commodities are receiving fairly good car service but in some cases it has been found necessary to curtail distribution for stone, sand and gravel. Texas market centers call for stock cars so loudly that it has been found necessary to withdraw these cars from service farther east.

The appointment by the Interstate Commerce Commission of terminal committees in thirty railroad centers is expected to give immediate relief. In addition to these committees, general committees have also been established by the railroads at each of the thirty cities. The Chicago joint terminal committee is headed by T. C. Hays of the Interstate Commerce Commission as chairman; J. H. Brinkerhoff represents the railroads; Robert C. Ross, of the National Industrial Traffic League, acts for the shippers, and Commissioner Funk, for the Illinois Public Utilities Commission.

Business Affected by Transportation Difficulties

Frequent mention of the effects of transportation difficulties is made in a review of general business and financial conditions during the month of May, contained in the Federal Reserve Bulletin. The continuance of labor difficulties and unrest, particularly in connection with the railroads, when added to the difficult situation produced by car shortage, has caused considerable interruption to business operations, the Bulletin says.

In district No. 2 (New York) there was noted a considerable accumulation of goods awaiting shipment resulting from strikes. In district No. 3 (Philadelphia) the congestion of freight and accompanying conditions have combined with a quieter state of things in the markets and a larger relative public demand for medium and lower priced goods, to alter in some respects the general drift of development of preceding months. In district No. 7 (Chicago) the transportation and associated difficulties noted elsewhere in the country are said to appear to be especially acute. In district No. 10 (Kansas City) there has been a curtailed movement of livestock and grain, resulting from bad transportation conditions accompanied by severe financial hardships upon producers and shippers. In district No. 12 (San Francisco) the car shortage has hurt lumbering.

The transportation "tieup" is reported from all districts as having prevented normal movement to the markets, as well as for export, and a correspondingly larger use of credit. Large stocks of both corn and wheat are being carried on farms, in elevators and elsewhere. The delay in the movement of products is said to be serious everywhere.

In iron and steel, demand has continued very heavy and steel mills are booked far ahead. The ore situation is, however, not improved. Lake transportation has been slow. The railroads can handle only a small portion of the ore which is ready for shipment. A shortage of coal in the northwest is expected. Shipments of ore for April were only 231,000 tons, compared with 1,400,000 in April, 1919. Some mills have been fortunately situated in possessing a large supply of raw materials, and orders in practically all lines are booked for a long time ahead, so that manufacturers feel that the present year should be a time of continued prosperity. This, however, is largely contingent upon the development of better transportation and improvement in labor conditions.

Coal conditions have been particularly important in connection with iron and steel, as with other industries. In district No. 2 (New York) the supply is far below the demand and consumers are bidding against one another. Railroads are said to be more or less "the victims of systematic sabotage at their terminals." The car supply at the mines is only 30 per cent of normal, while the labor situation there is also unsettled. The situation as a whole "is such as to cause considerable concern among conservative coal men," and transportation is regarded as a fundamental factor requiring improvement. In the middle west coal shipments have fallen off. Lake shippers will pool their coal in order to increase the movement, but this is only a partial remedy. Not only does a general shortage of coal exist now, but a shortage next winter, which may curtail production of iron and steel at interior furnaces, is foreseen. In district No. 6 (Atlanta) the coal production is being held down, mines being able to get only an insufficient number of cars. Railroads throughout the district have placed orders for fuel for the next 12 months, "the amount in every instance being larger and the price higher than ever before." Production of bituminous coal for the country at large during April amounted to 32,006,000 tons, as compared with 46,792,000 tons during March, and 32,164,000 tons during March, 1919. In the southwest many bituminous coal mines are operating at only about two-thirds of capacity.

Commission and Court News

Interstate Commerce Commission

The Interstate Commerce Commission has approved for filing a large number of schedules filed by various railroads providing for reduced summer commutation ticket fares, usually on 25-ride or 54-ride tickets.

United States Supreme Court

Reparation Claims for Freight Overcharge Held Assignable

The Supreme Court of the United States holds that there is nothing in the Interstate Commerce Act to prevent an assignment to a third party of a claim for reparation for overcharges.—Spiller v. Atchison, T. & S. F. Decided May 17, 1920.

Decisions Under Employers' Liability Act

The Supreme Court of the United States holds that an employee, preparing sand for engines, who had sanded several engines destined for other states, crossed a track with a pail of ashes from a drying stove, emptied the pail and left it on the ground while he went to the engine-room to get a drink of water, and when returning for the pail and crossing the track was hit by an engine, was then engaged in interstate commerce within the Employers' Liability Act. It was attempted to separate the duty and assign it character by intervals of time and distinctions between the acts of service. The court held that the distinctions were too artificial for acceptance, and that the acts of service were too intimately related and too necessary for the final purpose to be distinguished in legal character. Justices Van Devanter and Pitney dissented.—Erie v. Lzary. Decided May 17, 1920.

An Erie employee worked in a signal tower, near to which was a pumping station for supplying water to Erie engines in whichever commerce engaged. While in attendance at the pumping station, where it was his duty to attend, the employee was injured. It was contended that when he descended from the tower and went to the pumping station he put off an interstate character. The Supreme Court holds, following Pedersen v. D. L. & W., 229 U. S. 146, that the employee's duty in the pumping station was performed on both commerces as were demanded and was a part of interstate commerce. Justices Van Devanter and Pitney dissented. Erie v. Collins. Decided May 17, 1920.

Adamson Law Does Not Require Railroad to Operate at a Loss

The Supreme Court of the United States, in a decision rendered on June 1, held that the Adamson eight-hour basic day law was not applicable to the Fort Smith & Western during 1917, on the ground that the increase in wages would have required the railroad to operate at a loss. The Fort Smith & Western was in the hands of a receiver and had made an agreement with its employees on a basis of wages when the United States district attorney threatened a receiver with a suit for violation of the Adamson law. The Fort Smith & Western Company filed a bill in equity to enjoin the receiver from conforming to the act, but the bill was dismissed by the lower court. The Supreme Court says that while the occasion for relief has now passed, the parties are entitled to a decision as to their rights and says that in its previous decision holding the act constitutional the court did not say that Congress could or did require a railroad to continue in business at a loss. The court says the act was passed to meet an emergency created by the threat of a general railroad strike and an insolvent railroad had succeeded in making satisfactory terms with its employees. To break such a bargain was not within the ends the Adamson act had in view. The decision of the lower court dismissing the bill for an injunction was reversed.

Foreign Railway News

LONDON.

An express train service, with three trains a week, it is reported, will be established from the middle of June between Prague and Trieste.

Passenger and Freight Rates Increased in Rhodesia

LONDON.

It is reported that owing to increased costs of operating the Rhodesian railways, it has been decided to increase freight rates by 25 per cent and passenger rates by 10 per cent.

Military to Help in Construction of Uruguayan Railway

LONDON.

It is reported that a bill has been proposed in Uruguay to authorize the employment of military units in the construction of the railway to unite Uruguayan and Brazilian railways.

German Railroad Officials Demand 1,500 Marks

LONDON.

According to the Deutsche Allgemeine Zeitung German railroad officials have demanded that the Government should pay a sum of 1,500 marks to every employee. They declare that grave consequences will ensue if the Government refuses. The Government's decision is still pending.

Two Class System on German Railroads

LONDON.

The German Minister of Traffic, Dr. Bell, in a speech held at the National Assembly on April 24, to commemorate the day on which the Federal Government took possession of the complete German State railroad system, stated that the German Railroad Administration intends to introduce the two-class system on all lines in the near future.

Modern Methods to Be Introduced on German Railroads

LONDON.

Zeitung des Vereines Deutscher Eisenbahnverwaltingen stated that an extensive reorganization of the railroad administration is planned, aiming to introduce in every section of the railroad modern methods of management, in order to be able to get the greatest output with greatly reduced expenses and with the least amount of effort.

Cost of Railwaymen's Increases in England

LONDON.

The new demands of the National Union of Railwaymen for a uniform increase of 20 shillings ($5) a week which is now being considered by the Railway Wage Boards in Great Britain is estimated to involve an increase in expenses of $125,000,000 to $150,000,000 a year apart from the increases which would have to be given to other classes of men employed by railway companies but not engaged in operation. To meet such an addition to the railway expenses the rates will have to be increased.

Railway Freight Car Builders' Wages to Be Increased

LONDON.

The Industrial Court recently issued its award in the arbitration committee between the Amalgamated Society of Railway Vehicle Builders, Wheelwrights, Carpenters and Mechanics, and the Joint Wages Board of the Railway Wagon Builders' Association and the Railway Wagon Repairers' Association. It is as follows:

Time workers to receive an advance of 6 shillings per full ordinary week or 1½ pence per hour, according to the custom of payment.

Piece workers, an equivalent advance.

German Railwaymen Demand New Highly Increased Wages

LONDON.

According to the Zeitung des Vereines Deutscher Eisenbahnverwaltingen, the wage agreement between railroad and working men expires on May 31. The trade unions have entered into negotiations with the railroad ministry demanding highly increased rates, claiming the wages now in force being about half those paid private establishments. It was finally agreed to grant an advance of 20 to 80 pfennigs (5 to 20 cents) an hour in addition to the wages already paid, amounting to about 250 to 300 pfennigs (6 to 72 cents) per hour. This agreement is pending its final approval by the National Assembly.

Personnel of Ministry of Transport

LONDON.

Sir Eric Geddes, Minister of Transport, replying to a question in Parliament, said that 51 officials have been transferred to the Ministry of Transport from railway companies and 17 are serving in the Ministry of Transport on loan from railway companies or the Railway Clearing House.

He further stated that the following were employed in the headquarters offices of the Ministry on April 30: Administrative and clerical staff, 389; typists, 123; messengers and cleaners, 117. In addition there are employed locally, area transport commissioners and staff, 18; Irish branch, Dublin, 40. The above figures do not include the staff at harbors under the control of the Ministry of Transport or the staff of the government motor car pool.

Working Conditions in the Prussian State Railroad Repair Shops

LONDON.

The Charlottenburger Neue Zeit gives some interesting facts and figures about the working conditions in the repair shops of the former Prussian State Railroad. In consequence of the demobilizing act the number of working men employed by the repair shops was increased from 70,000 to 160,000. Notwithstanding this great increase the shops are unable to meet the demands made upon them. The decrease of efficiency of the repair shops is one of the most serious problems facing the railroad management. The fact that efficiency has gone down although the railroad management spent 447,000,000 marks in 1918, and 110,000,000 marks in 1919, for the improvement of equipment and although the materials needed, especially copper, have been delivered in the meantime in sufficient quantities, tends to show the serious aspect the situation has taken. In the summer of 1919, the repair shops turned out 750 repaired locomotives monthly. In November, 1919, only 650 were repaired and in January, 1920, only 520 locomotives were repaired.

Ball Bearings on Swedish Railway Cars

LONDON.

An abstract by the Technical Review from Zeitschrift des Vereines deutscher Ingenieure states that in the year 1915 the Swedish State Railways equipped 50 ore cars (automatic discharging type) with ball bearings, with which a number of tests have been carried out to determine the effect of the ball bearings on the train resistance.

The test cars were all three-axle ore trucks, weighing 11.5 tons and carrying 35 tons, so that the pressure on the axles at full load was just over 15 tons. It was found, in the comparative trials made as to the starting and traveling resistance with ordinary and ball bearings, that with the plain bearings the resistance is largely dependent on the time during which the trucks were in motion, and on the temperature of the outside air and the load applied. The higher starting resistance, which for the most part is made up of the static frictional resistance, depends on the time the car has remained standing and at the temperature of the air. With ball bearings, however, the resistance is quite independent of these external factors, being 38 per cent lower than with plain bearings. The starting resistance with ball bearings is not greater than the resistance in motion. Repeated experiments have shown that the length of the trains can be increased from 15 to 38 per cent (according to gradient), where ball bearings are exclusively used. No trouble has been caused through hot bearings.

Equipment and Supplies

Locomotives

THE GRAND TRUNK is inquiring for 12 eight-wheel switching locomotives.

THE PENNSYLVANIA EQUIPMENT COMPANY, 1420 Chestnut street, Philadelphia, Pa., is in the market for a Consolidation locomotive weighing 75 to 80 tons.

THE PHILADELPHIA & READING has ordered 25 Consolidation type locomotives from the Baldwin Locomotive Works, and will build five Pacific type and five switching locomotives in its shops at Reading.

Freight Cars

THE CLARK CAR COMPANY, Pittsburgh, Pa., is inquiring for 250 side dump cars.

THE YOUNGSTOWN SHEET & TUBE COMPANY, Youngstown, Ohio, is inquiring for 500, 50 to 70 ton hopper coke cars.

THE BY-PRODUCTS COKE CORPORATION, Syracuse, N. Y., is inquiring for 400, 70-ton hopper cars and 575, 55-ton hopper cars.

THE GLEN-NINA TANK LINE COMPANY, Buffalo, N. Y., has ordered five 8,050-gal. tank cars from the Pennsylvania Tank Car Company.

THE KENDALL REFINING COMPANY, Bradford, Pa., has ordered three 8,050-gal. tank cars from the Pennsylvania Tank Car Company.

THE CHESAPEAKE & OHIO, reported in the *Railway Age* of April 23 as being in the market for 1,000, 100-ton coal cars, has ordered 500 of these cars from the Pressed Steel Car Company and 500 from the Standard Steel Car Company.

THE SAN FRANCISCO TANK CAR COMPANY, San Francisco, Cal., is in the market for 40, 80,000-lb. capacity flat cars and 30, 80,000 to 100,000-lb. capacity steel underframe box cars; also 15 steel or wood underframe tank cars, 6,000 to 10,000-gallon capacity.

Passenger Cars

THE JAPAN TRADING COMPANY, INC., 331 Fourth avenue, New York, is inquiring for a number of subway cars.

Iron and Steel

THE MISSOURI, KANSAS & TEXAS has let a contract to the American Bridge Company for a turntable to be installed at Hannibal, Mo., requiring 158 tons of steel.

Miscellaneous

THE FORBES-PERKINS COMPANY, RODNEY D. CHIPP, New York manager, 120 Liberty street, is in the market for 75 tons of iron and steel bars; also for 10 tons of spring steel, 11 tons of copper ingots, and 10 tons of lead for export, to be used on railroads in Brazil.

Signaling

THE MISSOURI, KANSAS & TEXAS has placed an order with the Union Switch & Signal Company, Swissvale, Pa., for automatic block signals to be installed between Wybark, Okla., and McAlester, and between Colbert, Okla., and Red River, including yard protection at San Antonio, Tex. The installation will embrace a total of 111 style "S" d. c. signals with all attendant apparatus.

Supply Trade News

The American Spike Company has removed its offices from 55 Liberty street to 71 West Thirty-fifth street, New York.

W. Searle Rose, district manager of **W. L. Brubaker & Brothers,** manufacturers of taps, dies and reamers, 50 Church street, New York, has been appointed sales manager.

The Central Steel & Wire Company, Chicago, has bought a site, 260 by 432 ft. at Western Boulevard and West 45th Place, Chicago, on which it will build a warehouse at an estimated cost of $400,000.

Henry H. Knapp, who for several months past has been acting treasurer of the **U. S. Light & Heat Corporation,** Niagara Falls, N. Y., was elected treasurer at a meeting of the board of directors held on May 24.

The Electric Storage Battery Company, Philadelphia, Pa., will remove its Cleveland, Ohio, office about June 10, from rooms 1217-1222 Citizens building, which it has occupied since May, 1903, to Chester avenue and East Twenty-fourth street.

Don C. Wilson has been appointed assistant sales manager in charge of the railroad department of the **Edison Storage Battery Company,** Orange, N. J., with office at Room 904, 23 West Forty-third street, New York. Mr. Wilson was educated in the public schools of Broken Bow, Neb., and the Nebraska State University, completing his course in electrical engineering in 1907, after which he was engaged in electrical work in various capacities with the Stone & Webster Construction Company, at Seattle; the United States Navy Yard, Bremerton; the Pacific Gas & Electric Company, Los Angeles; the Independent Telephone Company, Omaha; the Union Pacific Railroad, Omaha; the Central of Georgia, Savannah; the Delco Light Company, Chattanooga, and the Edison Storage Battery Company.

D. C. Wilson

Edward A. Everett, manufacturer of railroad and signal appliances, announces the removal of his sales office and factory from 123 Liberty street, New York, to new and larger quarters at 136-138 West avenue, Long Island City, N. Y.

Charles W. Gregg, formerly connected with the legal department of the New York Central, and later with the Bureau of Safety of the United States Railroad Administration at Washington, has opened an office as counselor at law in New York City, No. 7 East 42nd Street.

Westinghouse, Church, Kerr & Company, Inc., announces the removal of its offices from 37 Wall street, to Grand Central Palace, 125 East Forty-sixth street, New York. Until the completion of the merger with Dwight P. Robinson & Co., Inc., the business will be conducted under the present name.

Percy M. Brotherhood, senior vice-president of **Manning, Maxwell & Moore, Inc.,** New York, has been appointed executive vice-president with the powers and duties attaching to the office of president, succeeding **Alfred J. Babcock,** president, who resigned on account of ill-health. Mr. Brotherhood has been associated with the company for over 25 years and during recent years has been in charge of its machine tool business. **Eugene Maxwell Moore** was recently elected vice-president in charge of foreign sales. **Henry D. Carlton** has been elected a director of the corporation, following his recent election to the office of vice-president in charge of the brass goods sales, succeeding the late **John N. Derby. Robert A. Bole,** Pittsburgh district manager, has also been elected a director.

Simon M. Dolan, whose election as vice-president of the **G. F. Cotter Supply Company,** Houston, Tex., was noted in the *Railway Age* of May 28, began railway work with the Baltimore & Ohio as a boilermaker apprentice at Garrett, Ind. Two years later he was made a machinist apprentice, and subsequently served on various railroads and in industries as a machinist and for a short time as a locomotive fireman. From 1894 to 1902, he was with the Wiggins Ferry Company, St. Louis, consecutively as general foreman, master mechanic and superintendent, and also served as master mechanic on different railroads, including the Arkansas & Choctaw, now part of the St. Louis-San Francisco, and on the St. Louis Sectional Docks. He subsequently went to the Southern Railway as general mechanical inspector, and later was consecutively master mechanic of the Mobile division at Selma, Ala., and of the Atlanta and Charlotte divisions at Atlanta, Ga. In 1905, he went to the Missouri Pacific as master mechanic at Little Rock, Ark., and later served in the shops at Sedalia, Mo. In 1908 he entered the service of the Scullin Steel Company in its steel plant and later was sales agent and assistant to the vice-president in charge of sales, respectively. He was sales agent for the American Car & Foundry Company, St. Louis, in 1911, and four years later went with the Chicago Varnish Company, resigning from the position of western and southwestern representative of its railroad department to become vice-president of the G. F. Cotter Supply Company.

S. M. Dolan

The Worthington Pump & Machinery Corporation, New York, announces that in addition to the lines of hydraulic machinery which it has manufactured since 1840, it has now completed preparations to furnish improved waterpower machinery of all capacities for low, medium and high head service, including hydraulic turbines, oil pressure system, water wheel governors and other auxiliaries.

Obituary

John Scullin, chairman of the board of the **Scullin Steel Company,** St. Louis, Mo., died in St. Luke's hospital, St. Louis, on May 28, at the age of 83.

Trade Publications

COWAN TRANSVEYOR.—A booklet of 28 pages, entitled Transveyor Picture Book, is being distributed by the Cowan Truck Company, Holyoke, Mass. It shows by means of illustrations the work that these transveyors are doing in a great variety of industries where they are being used. It also points out the advantages of their construction and contains specifications for all types.

Financial and Construction

Railway Financial News

CHICAGO & NORTH WESTERN.—The Illinois Public Service Commission has authorized this company to sell $15,000,000 first refunding 6 per cent mortgage bonds at not under 90.

DURHAM & SOUTH CAROLINA.—See Norfolk Southern.

NORTHWESTERN PACIFIC.—In an application filed with the Railroad Commission of California on May 17, this company asks for authority to issue $1,008,000 of bonds to reimburse it for $958,062 expended for additions and betterments.

NORFOLK SOUTHERN.—This company has taken over the Durham & South Carolina Railroad, which operates 42 miles between Durham, N. C., and Duncan.

The board of directors of the Norfolk Southern has been increased from 17 to 21 members, the additional members being Ernest Williams, president of the Durham & South Carolina Railroad; T. T. Harkrader, traffic manager of the American Tobacco Company; C. M. Carr, vice-president of the Durham Hosiery Company, and vice-president of the First National Bank of Durham, and E. C. Granbury, of Harris, Forbes & Co., New York. R. B. Williams, Jr., of New York, has been elected a director to succeed Frank A. Sayles, deceased.

UNION PACIFIC.—Kuhn, Loeb & Co. are offering an issue of $10,000,000 four to fifteen year 7 per cent equipment trust certificates, ranging in prices from 100 to 101, according to maturity. The certificates are secured by about $15,000,000 worth of equipment.

Railway Construction

BALTIMORE & OHIO.—On the main line of this road, between Cumberland, Md., and Sand Patch, Pa., four bridges will be reconstructed at a total estimated cost of about $100,000, as follows: Single-track through plate girder, 82 ft. long, crossing Jenner's Run, Mount Savage Junction, Md.; double-track deck plate girder span 73 ft. long, crossing Wills creek, F. O. Tower, Pa.; double-track deck plate girder span, 72 ft. long, crossing Wills creek, Glencoe, Pa., and double-track deck plate girder span, 72 ft. long, crossing Wills creek, Glencoe, Pa., all on the Connellsville division. The work calls for about 270 tons of steel. A contract for the fabricated steel work has been let to the American Bridge Company, and bids for the erection of these structures will be received in Baltimore on June 10.

CANADIAN PACIFIC.—The stockholders of this road, at the thirty-ninth annual meeting held at Montreal, Can., on May 5, authorized the construction of the following branch lines and extensions of branch lines; the Archive-Wymark branch, 25 miles; the Rosetown Southerly branch, 45 miles; an extension of the Weyburn-Lethbridge branch from Atawan to Manyberries, 35 miles; an extension of the Consul Southeasterly section of the Moose Jaw, Southwesterly branch of which 35 miles have been previously authorized from Vidora easterly, 35 to 60 miles; an extension of the Moose Jaw Southwesterly branch from Assiniboia southwesterly, 30 miles; the Leader southerly branch, 50 miles; the Duchess or Rosemary Northerly branch, 34 miles; the Cutknife to Whitford Lake branch, 40 miles; an extension of the Swiftcurrent Northwesterly branch from Empress northwesterly, 20 miles, and an extension of the Swiftcurrent Northwesterly branch from Sedgewick to Vegreville, 54 miles. The construction and extensions of these branch lines will proceed as soon as conditions warrant. The issuance of consolidated debenture stock was authorized to partly cover expenses.

THE PHILADELPHIA & READING has awarded a contract to the Roberts & Schaefer Company, Chicago, for a reinforced concrete coaling and sanding station at Tulip avenue, Philadelphia, Pa.

Railway Officers

Executive

W. A. Ballard, vice-president and general superintendent of the New Jersey, Indiana & Illinois has been elected president, with headquarters at South Bend, Ind.; **T. A. Hynes**, treasurer and traffic manager, has been elected vice-president and traffic manager, with the same headquarters.

W. H. Tobin has been appointed assistant to the president of the Trans-Mississippi Terminal Railroad Company, New Orleans, La., effective May 17. Mr. Tobin will have jurisdiction over all departments in matters pertaining to wage schedules, agreements and other relations between the company and its employees.

Alexander Robertson, whose appointment as vice-president of the Trans-Mississippi Terminal of New Orleans, La., was noted in the *Railway Age* of May 28 (page 1546), was born at Albany, N. Y., on November 4, 1860. He entered railway service as a brakeman on the Fitchburg Railroad in 1885, serving successively as conductor, general yardmaster, station master and trainmaster, until April, 1897. During the next six years he was employed by the Wabash as general yardmaster, trainmaster and superintendent. He was appointed manager of the Western Maryland and the West Virginia Central & Pittsburgh (now a part of the Western Maryland) in August, 1903. After a brief service, from 1904 to 1905, as manager of the Terminal Association of St. Louis, Mo., he returned to the Western Maryland and the West Virginia Central & Pittsburgh as vice-president and general manager. On May 1, 1911, he was promoted to the presidency of these roads. He was appointed assistant to the president of the Missouri Pacific in June, 1913, and two days later was promoted to chief operating officer. During federal control Mr. Robertson was appointed federal manager and vice-president of this road and on the return of the roads to private ownership he was appointed vice-president in charge of operation, which position he now holds, in addition to that noted above.

A. Robertson

Financial, Legal and Accounting

H. J. Jackson, district freight agent of the New Jersey, Indiana & Illinois, has been appointed treasurer and general freight agent, with headquarters at South Bend, Ind., and **F. E. Emery** has been appointed southwestern freight agent, with headquarters at St. Louis, Mo.

Operating

G. H. Sido has been appointed acting superintendent of transportation in place of **M. B. Casey**, temporarily granted leave of absence.

T. P. Mock has been appointed assistant superintendent of the Houston Belt Terminal, with headquarters at Houston, Texas, effective April 12.

William D. Page, trainmaster of the Northern Pacific, with headquarters at Seattle, Wash., has been transferred, with headquarters at the same place, to succeed **J. E. Campbell,** promoted.

Traffic

J. E. Light, assistant agent on the Southern Pacific, with headquarters at San Francisco, Cal., has been promoted to district freight and passenger agent, with headquarters at Salt Lake City, Utah, effective May 15.

Charles O. Williams, chief clerk to the general passenger agent of the Kansas City Southern, with headquarters at Kansas City, Mo., has been promoted to assistant general passenger agent with the same headquarters, effective May 1. Mr. Williams was born on June 17, 1874, at Springfield, Mo. He entered railway service in May, 1890, with the Kansas City, Fort Scott & Memphis, now part of the Frisco, as agent and operator. He was appointed city passenger and ticket agent on the Kansas City Southern at Shreveport, La., in 1903. Four years later he was appointed agent at the Grand Central Station at Kansas City, Mo., and in 1911 was promoted to traveling passenger agent. He was appointed chief clerk to the general passenger agent in 1917.

Engineering, Maintenance of Way and Signaling

L. H. Bond, assistant engineer on the Illinois Central, has been promoted to district engineer of the Northern lines, with headquarters at Chicago, effective May 20.

J. A. S. Redfield, division engineer of the Chicago & North Western, with headquarters at North Fond du Lac, Wis., has been appointed maintenance engineer, with headquarters at Omaha, Neb., effective April 10.

Purchasing and Stores

L. J. Ahlering, traveling storekeeper on the Chicago & Eastern Illinois, with headquarters at Danville, Ill., has been promoted to general storekeeper, with the same headquarters, succeeding W. T. Bissell, who has resigned to engage in other business, effective June 1.

Railroad Administration

George M. Huss has resigned as chairman of the committee on claims, Division of Liquidation, United States Railroad Administration, effective June 1, to resume his practice as a consulting engineer at Chicago.

Alfred Bettman, of Cincinnati, Ohio, has been appointed regional counsel of the central eastern region of the Railroad Administration and **O. A. Smith,** also of Cincinnati, has been appointed regional claim agent to assist Mr. Bettman.

Horace Epes, heretofore assistant to the assistant to the director general of the Railroad Administration, has been appointed special assistant to the manager of the department of materials and supplies, with office at Washington. Mr. Epes was special assistant to the southern regional director during the period of federal control.

The Department of Traffic, Division of Liquidation Claims of the U. S. Railroad Administration, has announced the following appointments, effective May 17: **W. K. Vandiver,** assistant manager in charge of formal complaints, Southern and Pocahontas regions; **C. I. Johnson,** assistant to manager, in charge of formal complaints, Eastern and Allegheny regions; **C. B. Ackerman,** assistant to manager, in charge of formal complaints, Northwestern and Central Western regions; **W. B. Knight,** assistant to manager, in charge of formal complaints, Southwestern region; **J. A. Little,** assistant to manager, in charge of short line adjustments; **H. D. Boynton,** assistant to manager, in charge of passenger, baggage and express adjustments; **H. S. Jones,** assistant to manager, in charge of informal complaints.

Obituary

E. L. Weisgerber, formerly general master mechanic at the Mount Clare shops of the Baltimore & Ohio, died recently at his home in Newark, Ohio.

Horace Jewel Temple, general superintendent of the Southern Pacific of Mexico, with headquarters at Empalme, Sonora, Mex., died in Empalme on April 2. Mr. Temple was born at Monroe, La., on March 14, 1869, and entered railway service as a messenger with the Gulf, Colorado & Santa Fe, in April, 1882, In 1884, after a brief service as a telegraph operator with the Western Union, he returned to railroad work as an operator on the Texas & Pacific, and four years later was appointed agent and operator on the Southern Pacific. He was appointed claim agent and assistant operator on the Cananea & Consolidated Copper Company Railway in June, 1901, and one year later became superintendent of the Cananea, Rio Yaqui y Pacifico, remaining as superintendent upon the consolidation of this road with the Sonora in 1908. He was appointed general superintendent of the Southern Pacific of Mexico on August 23, 1911.

H. J. Temple

L. J. Putnam, chief engineer of the Chicago & North Western, with headquarters at Chicago, was drowned at Leroy, Mich., on May 29. Mr. Putnam was born at Manchester, Ia., on February 17, 1878, and was educated at Cornell College, Mt. Vernon, Ia., where he studied civil engineering. He began railway service in June, 1898, with the Illinois Central, and in June of the following year entered the service of the Chicago & North Western as an instrument man. From February, 1901, to March, 1906, he was assistant engineer on construction, location and maintenance, following which he was promoted to acting division engineer on the Ashland division at Kaukauna, Wis. From March, 1907, he was consecutively assistant engineer in charge of second track and terminal improvements at Janesville, Wis.; assistant engineer in charge of the construction of a bascule bridge over the North branch of the Chicago river at Chicago and of the Wells Street yard at Chicago, and resident engineer on track elevation at Milwaukee, Wis., and on ore dock construction at Escanaba, Mich. From July, 1910, to April 1, 1912, he was with the Milwaukee, Sparta & North Western, a subsidiary of the Chicago & North Western, as resident engineer on construction and later as acting resident engineer. On April 1, 1912, he was promoted to division engineer at Boone, Ia., and in May, 1913, he was promoted to principal assistant engineer, with headquarters at Chicago. He was promoted to chief engineer on June 12, 1918.

L. J. Putnam